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"In adopting our title of the *Journal of Mental Science, published by authority of the Medico-Psychological Association,* we profess that we cultivate in our pages mental science of a particular kind, namely, such mental science as appertains to medical men who are engaged in the treatment of the insane. But it has been objected that the term mental science is inapplicable, and that the term mental physiology or mental pathology, or psychology, or psychiatry (a term much affected by our German brethren), would have been more correct and appropriate; and that, moreover, we do not deal in mental science, which is properly the sphere of the aspiring metaphysical intellect. If mental science is strictly synonymous with metaphysics, these objections are certainly valid; for although we do not eschew metaphysical discussion, the aim of this JOURNAL is certainly bent upon more attainable objects than the pursuit of those recondite inquiries which have occupied the most ambitious intellects from the time of Plato to the present, with so much labour and so little result. But while we admit that metaphysics may be called one department of mental science, we maintain that mental physiology and mental pathology are also mental science under a different aspect. While metaphysics may be called speculative mental science, mental physiology and pathology, with their vast range of inquiry into insanity, education, crime, and all things which tend to preserve mental health, or to produce mental disease, are not less questions of mental science in its practical, that is in its sociological point of view. If it were not unjust to high mathematics to compare it in any way with abstruse metaphysics, it would illustrate our meaning to say that our practical mental science would fairly bear the same relation to the mental science of the metaphysicians as applied mathematics bears to the pure science. In both instances the aim of the pure science is the attainment of abstract truth; its utility, however, frequently going no further than to serve as a gymnasium for the intellect. In both instances the mixed science aims at, and, to a certain extent, attains immediate practical results of the greatest utility to the welfare of mankind; we therefore maintain that our JOURNAL is not inaptly called the *Journal of Mental Science,* although the science may only attempt to deal with sociological and medical inquiries, relating either to the preservation of the health of the mind or to the amelioration or cure of its diseases; and although not soaring to the height of abstruse metaphysics, we only aim at such metaphysical knowledge as may be available to our purposes, as the mechanician uses the formularies of mathematics. This is our view of the kind of mental science which physicians engaged in the grave responsibility of caring for the mental health of their fellow-men may, in all modesty, pretend to cultivate; and while we cannot doubt that all additions to our certain knowledge in the speculative department of the science will be great gain, the necessities of duty and of danger must ever compel us to pursue that knowledge which is to be obtained in the practical departments of science with the earnestness of real workmen. The captain of a ship would be none the worse for being well acquainted with the higher branches of astronomical science, but it is the practical part of that science as it is applicable to navigation which he is compelled to study."—*Sir J. C. Bucknill, M.D., F.R.S.* (*Journ. Ment. Sci.*, vol. vii, 1861, p. 137).

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Part I.—Original Articles.

THE TWENTY-FIRST MAUDSLEY LECTURE: NOSOPHOBIA.

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"Fear is more pain than is the pain it fears."
SIR PHILIP SIDNEY.

IN the opening chapter of his *Body and Mind* (1873) the physician and philosopher whom these lectures commemorate wisely insists that our inquiries into human faculties should begin with the elementary and proceed only later to the elucidation of the complex. "Surely," he says, "it is time that we put seriously to ourselves the question whether the inductive method, which has proved its worth by its abundant fruitfulness wherever it has been faithfully applied, should not be as rigidly used in the investigation of mind as in the investigation of other natural phenomena. If so, we ought certainly to begin our inquiry with the observation of the simplest instances . . . ." In the chapters which follow he applies this principle, and—or so it seems to me—provides a number of healthy correctives to much modern thinking and writing, and not least to the opinions of those who have allowed too little or assumed too much in their appraisals of the body-mind relationship. If we have for too long separated psyche and soma, past and present, organism and environment, individual and society, in our attempts to fathom Man, may not an extension of interest in a primitive emotion such as fear, in which the interdependence of all of these is manifest, have value?

My concern to-day will be with some very common and understandable fears and their effects—fears which scarcely one of us escapes, which may be trivial and transitory, but which may also assist the perpetuation of much unhappiness and of both physical and mental illness. For the most part they may be regarded as relatively "simple instances." At least they are elementary by comparison with some of the other mental and emotional conflicts which the physician and psychiatrist encounter in their work. If any less

simple, the fears which I have in mind are certainly more accessible for study than the immediate fears of present danger.

From the primitive phase of man's history, with its alarms created by pestilence or personal illness—long viewed as the inflictions of gods or devils—we can trace the story of disease-fears throughout the Christian era. Alike in the pre-Christian and Christian periods the fear of pain, disablement or death was buttressed by the fear of unseen agencies believed to be in some way responsible for them. Until quite recent times physical disease was still regarded by many as a punishment for sin, and mental illness as demoniac possession. Modern man, more sophisticated than his ancestors, suffers from an abundance of half-knowledge where they suffered from ignorance, and from enslavement where they more readily enjoyed release by the emotions.

Fears of disease may also be accepted as among the simplest instances of body-mind disturbance in that, once their ubiquity is recognized by the physician, they can be fairly readily unmasked; or, alternatively, without actual unmasking, their effects can often be anticipated or relieved by direct and simple psychiatric methods. And yet we should not, I think, be wide of the mark in suggesting that medical men in all branches of the profession constantly miss opportunities of reassuring scared or anxious patients, and of removing or mitigating the associate symptoms which fears of disease or its consequences create or aggravate. Furthermore, while primitive superstition has declined, there are still numerous customs and traditions and other social influences assisting the prevalence of disease-fears in the community which need not be deemed unalterable to-day. There are thus various actions based upon better individual and social understanding which could, by concerted endeavour, make a genuine contribution to curative and preventive medicine and to individual and communal health. Whether I make an exaggerated claim in respect of the importance and prevalence of disease-fears in our modern world, it remains for others to decide on the basis of the arguments here assembled and their own experience.

Although, for the most part, clinical teachers and the text-books of medicine touch rather lightly upon this subject, it has an evident interest for the world of patients and their relatives, and it should therefore be seriously presented to every student. Geraldine Coster, in her understanding little book, *Psychoanalysis for Normal People* (1932), opens her chapter on adult fears as follows: "Fear of disease is one of the commonest causes of adult neurosis. The ordinary man without medical training is often curiously ignorant, and as it were superstitious, about heredity and infection in connexion with disease. Foolish newspaper articles and half-understood fragments of conversation heard in youth prey upon the minds of people who would shrink from admitting their anxiety even to a physician." This general unwillingness to admit to fears is a particular reason both for their perpetuation, and for the too frequent failure on the part of our profession to give them the full consideration that is their due. In studying fears of disease, we can trace the whole gradation from the natural reactions of healthy people and the physically sick or injured, through the anxious preoccupations of the neurotic, to the morbid obsessions of the insane.

The Occasions of Fear.

Fears and anxieties in a modern society are of many kinds and they have many causes. Most of them are personal and private, and are so rarely or so slightly accompanied by objective manifestations that the assessment of their frequency in any selected population must, for the present, remain beyond computation. Their effects are more apparent in medical practice than their nature or their causes, and yet the last named, on the whole, are the more readily understood.

After excluding contagious fear or panic and all those major and more urgent fears of injury and loss which may come to us in times of war or civil disaster, there still remain countless day-to-day anxieties which affect both children and adults in varying kind and measure. All of these are apt in civilized man, with his highly organized nervous system, his more retentive memory, his power of foresight, and his tendency to repress the outward display of emotion, to lead to more obtrusive and less transitory mental, visceral and vascular disturbances than may be presumed to obtain among primitive races and animal species. Some human fears are related to the known and the natural, some to the unknown, the half-understood and the supernatural. Common observation tells us that the occasions for these prevalent fears include, for example, ideas relating to admonition or punishment; to ridicule or social censure; to loss of employment and earning capacity. Others are connected with the uncertainties of new undertakings, of new jobs or of sexual experience; and others again with the problems of sin and the hereafter. And yet the physician's experience may well lead him to suppose that none of the fears traceable to these specified occasions exceed in frequency those which are born of ideas and misconceptions connected with physical or mental illness.

Every present physical pain or discomfort and every evident injury or outward sign of broken or threatened health which compels, or should compel, a visit to the doctor is capable of promoting anxiety. The more anxious by temperament the patient, the more readily will it do so, but the steady and courageous are not immune. It is true that injuries, if not too grave or trivial, may also be accompanied by a sense of resignation, resentment, relief, or (in youth) even of pride and importance, which can replace or over-ride present anxiety and the fear of the circumstances which caused them. War wounds in the first world war were never, in my experience, accompanied by the manifestations of "shell-shock." There are also invalid persons who "enjoy" their sickness for the sympathy and escape from responsibility which it secures; their fears lie in other directions. In grave conditions of surgical shock and haemorrhage or advanced illness, fear would seem to be largely eliminated by the altered sensibilities accompanying these states, so that conditions of extreme danger are often, at the time, not appreciated as such by the patient. The anxieties due to frank physical illness or trauma are, however, less common than those due to ideas of physical disease prompted by hearsay or by minor symptoms of passing functional derangement. Of all these anxieties, however initated, the vast majority go unspoken, and a

small proportion only, let it be repeated, are recognized at their true worth when medical advice is sought.

Some years ago I had occasion to ascertain the frequency and order of frequency of the common diseases seen by me up to that date in a general consulting practice. I found that among the twelve diagnoses which scored highest in my card index, *Anxiety* came second on the list. This diagnostic label was employed only when I judged it to be the main basis of a patient's symptoms and the physical examination revealed no sign of serious organic trouble. In the aetiology of four of the remaining conditions, including the first on the list, mental stress and anxiety are now believed to play at least a contributory part. In what proportion of all these cases the symptoms were due to or buttressed by specific disease-fears, as distinct from or additional to other causes of anxiety, I cannot say, but I am satisfied that it was a large one. Apart from the cases included under this generic label of *Anxiety*, a much smaller group were specifically indexed under such headings as "Cancer Phobia" and "Syphilophobia."

Even among ostensibly healthy persons unspoken fears are common. My colleague, Dr. R. W. Parnell, has analysed for me his findings in the case of 155 university students (representing some 60 per cent. of a group accorded the opportunity of a free health examination) who were not at the time under medical care. Twenty-two admitted to anxieties, and of these ten were harbouring anxieties about disease.

Physical pains and fears are, after all, the two primary dis-eases which our patients bring to us; and the latter are generally brought to us in the guise of the former.

The Recognition of Fears.

It may reasonably be asked how fears to which patients do not openly admit can be recognized as operative or assessed as contributory to illness. The first essential is that they should be thought of. The evidence is otherwise generally indirect. It is seldom such as to carry the conviction at once of objective signs, but it may be more important than objective signs, and we do well to remember that many of our most accurate diagnoses in practice are, and always will be, based upon history and subjective symptoms. The recognition of fears, improving with the growth of experience, is usually based upon (1) the history of the patient and his family; (2) the nature of his symptoms, whether they be physical or mental, or both; (3) observations on his temperamental qualities and present demeanour; and (4) the response, in the form of immediate relief and subsequent improvement, to treatment consisting of simple explanation and reassurance—where these are possible—and of a reasoned optimism, encouragement or comfort where they are not. The less such treatment is confused by other measures, the more reliable will the conclusions be. In some cases it is appropriate to inquire, at a selected stage in the association of doctor and patient, whether a specific fear of disease has, in fact, been at work. In others it is wiser to assume its presence and to emphasize, after a careful examination and without the leading question, that "there are no signs of organic disease" or no signs of tuberculosis, appen-

dicitis, cancer, or such other condition as the symptoms may have seemed to suggest. The outward features of acute fear are rarely observable in the more restrained portraiture of chronic or recurrent anxiety. The pallor, tremor, sweating, dry mouth and tachycardia of the former—although present on occasion—tend to be replaced in the latter by intermittent gastric, oesophageal, colonic or cardiac discomforts or pain and by vasomotor instabilities. The face is marked rather by the stigmata of care than of alarm. At the time of a consultation we must accept that apprehension regarding the interview and the examination can be as potent as the fear of an adverse verdict, and allowance must be made for this in interpreting signs of agitation.

Definition and Varieties of Nosophobia.

The word "nosophobia" means neither more nor less than "the fear of disease." It has been applied more particularly to obsessional fears relating to a particular malady, but there is no sound reason for this restricted usage. Such fears differ from the others only in that they are graver in their degree and consequences and more persistent. They are an expression, in part, of inherently unstable personality. I shall here apply the term to all forms and degrees of fear or anxiety, whether rational or irrational, connected with disease or ideas of disease. These may be held to include :

1. Fears about an existing illness or injury and its possible import ; about the tolerability of anticipated pain ; and about confinements, anaesthetics and operations which are, for the patient, an occasion of trauma and a common cause of dread and apprehension.

2. Fears of inheriting a disease, particularly epilepsy, insanity, cancer and tuberculosis.

3. Fears of acquiring diseases, particularly those due to well-known types of infection.

4. Fears connected with a non-existent disease which a patient nevertheless imagines or suspects (usually on the basis of some subjective symptom) that he has already acquired.

5. Fears of death or dying considered as the final malignity of illness and, in the latter case, too widely suspected of involving painful or distressing experience.

In all of these, and particularly the last, popular ignorance or the factor of the "unknown" plays a part. In any one of them the fear may be related to ideas of personal suffering or disability associated, whether in fact or imagination, with the disease in question, or to its consequences for others. A fear about disease, whether real or imagined, in a near relative, and especially in a consort or child, constitutes another kind of nosophobia. In this case anxiety can be transferred from one person to another, may react unfavourably upon the patient, and may even come to involve a whole family. The timid and neurotic child of over-fond and protective parents is a familiar product of habitual anxiety or recurring domestic panic.

Nosophobia is to be thought of both as an individual and, by reason of its prevalence, as a social problem. It is traceable in part to social influences,

and it lessens communal efficiency. In common with other social diseases, its extent and influence fluctuate within the community and vary from community to community. It would almost certainly be found to be commoner in the town than in the country, and among mental rather than manual workers. It has, I suspect, reached a high degree of prevalence in the urban populations of the United States, where disease-consciousness is more assiduously cultivated by the press and other agencies than in our own country. Although panics due to the major epidemic diseases have largely disappeared from the western world in concert with their increasing control, there are signs that popular nosophobia of a less patent type is widespread and contributing to much of our present-day neurosis; and this notwithstanding that we command more instruments for the protection of life and the prevention and relief of sickness than in any previous age.

Where treatment and prevention are concerned it is therefore necessary to think not only in terms of individual but also of social psychiatry and appropriate public actions. To these ends the first essential is an advancement of our understanding of the varieties, manifestations and causes of what it is desired to counter.

Varieties of Nosophobia.

The varieties of nosophobia could be variously determined and classified by such factors as the severity of the disorder or the degree of specificity of the operative fears, or in other ways. We should, in all probability, find that the most grievous varieties are the least frequent and the lesser varieties the most frequent and tractable; that the specific fears in a modern society are more common than the non-specific; and that the causal influences are always multiple. The manifestations would include both changes of mood, in the direction either of agitation or depression, and physical symptoms. The latter usually have a visceral or vascular notation, a rather indefinite character and time-behaviour and show a relatively slight connection with physical events, and often a reference to several systems or somatic areas—a feature usually inconsistent with a diagnosis of organic disease (*vide* Cases 1, 2, 7 and 8 reported hereunder). The symptoms, in brief, do not differ from those attributable to other anxieties, excepting in so far as a relation between the part affected and the specificity of the fear may be discernible.

For simplicity of description, I propose to consider some types and examples of nosophobia under the three headings of (*a*) obsessional nosophobia; (*b*) nosophobia accompanying structural disease or injury and certain alarming episodes; and (*c*) nosophobia occurring independently of these.

Obsessional Nosophobia.

Victims of this form of the malady are usually psychoneurotic or psychotic persons. Their fears are irrational or slenderly based. They may be superimposed upon emotional disorder having other origins. They become firmly implanted, and are not readily uprooted even by examinations of the most searching kind in concert with the fullest assistance of psychotherapy. Syphilo-

phobia is a familiar example. It may affect those who have never been exposed to infection in the ordinary way and yet the sense of guilt or taint —sometimes referable to a faulty, puritanical upbringing—is strongly operative. Serious mental breakdown is common. Obsessions in regard to tuberculosis, cancer, appendicitis and heart disease are also encountered, but in my experience have usually appeared more manageable.

Case 1.—*Syphilophobia.* A nervous man, aged 31, married and with children, developed warts on the hands and a friend told him that they were venereal. He was terrified and began to be physically "sick with worry." Pains in the joints followed and then he thought he had a stricture. He lost energy and all interest in his business and dropped two stone in weight.

Case 2.—*Syphilophobia.* A man, aged 35, who had been a prisoner in German hands during the first world war for four years, was treated during that period for a urethritis, but denied exposure. After his return he was pronounced free from infection, and his blood W.R. was also negative. In the course of the next few years he had much sorrow and loss, his first wife dying in childbirth and his second from a cerebral abscess. A year before I saw him his urethral discharge reappeared. He was treated without a bacteriological examination. My notes state that "he has developed a persistent obsession that he has syphilis. He complains of pains in the sacrum, the perineum, the neck, the eyes, and under the finger-nails, of flatulence and insomnia and has lost a stone in weight." I discovered a to-and-fro aortic murmur (which was rather disconcerting), refrained from discussing it with him, and admitted him to hospital for further investigation after giving a reassuring forecast. There we obtained another negative blood test and also a negative urethral smear, and, in explanation of the murmurs, a history of three attacks of rheumatic fever in boyhood. He was at the time much comforted by these reports and by a further explanation and strong reassurance, but I have not heard how he fared subsequently. The background of a long imprisonment and his domestic tragedies probably played a large part in maintaining his anxiety of mind and conditioning the phobia into which it had crystallized.

Case 3.—*Infection phobia.* A student contemporary of mine, now dead of a disease which he probably never feared, developed what amounted to a compulsion neurosis in regard to the possibility of infection. Having washed in the hospital he would wash again in the students' club before his meals, open the swing doors with his elbows, eat his College lunch, and then flame the end of his cigarette before putting it in his mouth. The unhygienic condition of the kitchens and dining-hall in those days and the fact that the food and the utensils must have passed through many unwashed hands before they reached him did not seem to worry him. The fact that hundreds of men risked dining in College year after year, took none of his precautions and yet acquired no fell disease had also failed to impress him.

Although we may assume an inherent liability in each of these cases, in each effective extraneous influences precipitated the mental sickness or unbalanced behaviour.

Nosophobia Accompanying Physical Disease and Certain Alarming Seizures.

An episode such as an haemoptysis or haematemesis, an anginal attack, labyrinthine vertigo, a vaso-vagal attack (Gower's syndrome), fainting, an asthmatic attack and the aphasic or hemiplegic varieties of migraine, may very naturally cause acute anxiety, both in the victim and those about him. Here, prompt action can often be taken by the doctor, and his very presence

is reassuring. It is never, however, superfluous to make positive, comforting pronouncements, even while medical judgment is still hampered by uncertainty. Situations familiar to the physician and not conveying ideas of too grave a risk to him may, it must be remembered, be infinitely alarming to the lay mind. If we exclude a few incurable diseases, the moribund state, and certain crises accompanying the extremes of age, optimism is, in fact, far more frequently justified than pessimism, even in many of the more hazardous situations.

In recurring conditions like *angina pectoris*—although it is often consistent with many years of useful life at a reduced level of output—the name and nature of the disease, the frequent physical reminders of the pain, and sometimes the distressing "sense of dying," may between them give rise to haunting anxieties and unnecessary modifications of living. Here we may witness a return of mental peace, a resumption of interests and other physical and mental improvements as the immediate consequence of nothing more than explanation and a more reassuring prognosis. Cardiologists, like other specialists, are sometimes preoccupied rather with the organ than the person ; with physical instructions and treatments rather than with intimate human understanding. Their intellectual caution and desire for accuracy in the matter of prognosis, while frequently supported by reason and experience, need not be betrayed to the patient, nor made too explicit to relatives. Reputations are not lost by preserving hope, even when the hope is falsified.

In *labyrinthine vertigo* patients are not infrequently afflicted with the dread of strokes or death in an attack or of attacks while crossing the street. Few things, after all, can be more provocative of anxiety than states of complete instability and incapacity arriving "out of the blue." Here again I have seen simple explanation and vigorous reassurance do great good. Although the opinion is insusceptible of proof, it has even seemed to me possible that resultant improvements in general and mental health may sometimes lessen the liability to the attacks. Sensible, direct psychotherapy and counsels of patience in such cases should usually be considered preferable to modern surgical procedures which involve no small risk and may introduce yet another anxiety.

Petit mal, especially in intelligent professional men and women, can be a cause of serious apprehension, particularly in relation to loss of skills and earning power and the possible supervention of major epilepsy. Here, too, I have seen patients, including colleagues, greatly assisted by explanation and by a good prognosis, later fully justified by history and performance. *Fainting attacks* in young people, and innocent palpitations or undue awareness of normal cardiac action at all ages, are frequently feared as manifestations of organic heart disease. Here reassurance and explanation are almost the whole of treatment. In many other diseases, acute and chronic, rapid improvement follows so often upon a more favourable forecast than had previously been allowed, and upon the resulting change of atmosphere in the house and sickroom, that it is difficult to doubt the reality of unexpressed fears as a retarding factor in recovery or the uses of optimism in treatment. In the more chronic conditions, such as arthritis and the dyspepsias, the physical

symptoms, never long in abeyance, both aggravate and can be aggravated by anxiety. Even in these tiresome conditions a better prognosis and encouragement to " live more normally with a view to feeling more normal " may bring help. May not the quick recoveries of children, their frequent happiness during long hospitalization and their immunity from some of the commoner chronic diseases of adults be due not only to their shorter exposure to adverse influences and to the relative resilience of their youthful and growing tissues, but partly also to their freedom from foreknowledge and foreboding ?

Nosophobia Without Definite Disease.

This is by far the largest category. In a high proportion of cases the fears are related to cardiac or abdominal symptoms.

My case-records include those of a number of medical men and women who came in fear of cancer or other organic disease, a fear frequently based upon symptoms which would scarcely have given them pause in the case of their own patients. Personal anxiety inevitably hampers judgment. For this reason alone we are, or should be, reluctant to treat ourselves or our own kith and kin. If we look back upon experience—and how easily we tend to shelve it!—we can scarcely fail to recall instances, pronounced or trivial, of personal nosophobia in times of fatigue, sickness or stress, on the eve of an operation, or in the presence of an unexplained symptom. Medical students and graduates have their disease-fears like other people, and have been grateful for their mitigation by understanding colleagues. The more reason why, in the course of practice, they should allow no other preoccupation or exigency to excuse the additional time needed for one of the simplest and most salutary of all psychiatric exercises.

Prevailing Causes of Nosophobia.

In the individual an operative nosophobia—by which I imply a state of fear or anxiety too frequently engaging consciousness or giving rise to symptoms—has clearly, in common with other diseases and especially those of a chronic or recurring kind, a multiple factor aetiology. Within the complex of causes we may separate such factors as the temperament of the individual, moulded to a state of susceptibility by a combination of genetic and environmental influence ; antecedent stress or anxiety of another kind increasing sensibility and promoting bodily sensations, which in turn evoke the new specific fear ; a half-knowledge of the disease feared due to reading, acquired through gossip, or prompted by public pronouncements or actual aquaintance with a sufferer from the disease ; the usual native unwillingness to confess the fear to others, including the doctor, even when he is consulted for associated physical disturbances ; a consequent inappropriateness and ineffectiveness in the treatment prescribed ; and finally, the uncommunicativeness of medical men, their failure otherwise to inspire confidence, and, more rarely, their indiscreet pronouncements. A physical symptom or finding may create an anxiety, and an anxiety may create a physical symptom. The traffic of impulses between body and mind is a two-way or circular process. Mind

and body cannot—as Maudsley always insisted—be conceived as separately existent or functional, nor can they, with optimal results, be separately treated.

Popular fears of disease are variously propagated. Vulgar errors may be less numerous and less fantastic than they were in the days of Sir Thomas Browne, but they are still very common and a cause of much timid living and neurosis. Errors of belief and practice are passed as old wives' tales from neighbour to neighbour and mother to daughter, when they relate especially to pregnancy, childbirth and the supposed necessity for habitual purgation. Ignorance of the most elementary anatomy, physiology, psychology and pathology is still prevalent even among the otherwise well educated.

Fears of disease are widely engendered through the advertisements of proprietary medicines; by the outpouring of ill-judged medical articles in the lay press, of a type even more familiar, perhaps, to American than British readers; and by unorthodox practitioners. All of these make the appeal to fear a part of salesmanship, even though they seek simultaneously to inspire hope by promises of cure, promises which give them a competitive advantage over the honest doctor. The latter, by the more frequent recognition of fears and the employment of simple explanations and rational optimism, could, without doubt, enhance the value of his own treatments and, in the process, do much to shake belief in the unorthodox. Educationally, much could be done along the lines sponsored by the Central Council for Health Education and the personal and publicity services of the public health departments—not by mere condemnation, but by the appeal to reason and to the health rather than the sickness interest—to counter the evil effects of ignorance, superstition, and the traffic in proprietary remedies. Whatever part the various agencies cited above may play in promoting popular nosophobia, we must also reluctantly admit that the very people—doctors and nurses—who should do most to relieve disease-fears often fail to do so and sometimes inadvertently accentuate them.

The Doctor as an Aetiological Factor in Nosophobia.

In contradistinction to the welfare doctor, the Service doctor, and the physician in charge of a student health service (who start with the health perspective, and are mainly concerned with keeping mothers or others informed and hopeful and babies or other young people well), the practitioner, the consultant and the specialist start with the disease perspective, and are under the constant necessity of looking for or not overlooking organic disease. They, too, labour under an anxiety. They often encourage fears unwittingly through their partiality for prescriptions and operations; through their use of generic labels such as gastritis, neuritis, rheumatism, tired heart, and debility, all of which tend to suggest physical disease and chronicity or slow recovery to the patient's mind; and through their caution or their silences. Specialists in the physical branches of medicine too often err through concentration on a part of the body to the neglect of the whole person. The psychiatrist must frequently reduce his powers through failure to make a proper examination of the body. The general physician who gives the time requisite for a careful

history and a complete overhaul and a sympathetic explanation of his findings holds a very real advantage over those who do not or cannot afford the time, or who confine their interest to parts of the body or the mind. In our specialist age it has, in fact, become a major function of the general physician to examine thoroughly, to explain simply, to reassure as far as may be, and to protect his patients from unnecessary medical or surgical interventions. The routine functional inquiry and physical overhaul will again and again reveal some circumstance which directs attention to an unspoken anxiety. The age and sex of the patient or a casually mentioned symptom or physical finding may suggest the likely fear. The patient past middle life is apt to be concerned about cancer, his heart, or his blood-pressure; the young patient about tuberculosis, venereal disease, his mental state or impotence. Phosphaturia in young men is misinterpreted as spermatorrhoea and may be the occasion of a sexual neurosis. Loss of weight from one cause or another is variously interpreted at different age-periods. "Arthritis" is the nightmare of many people with muscular pains or creaking or clicking joints having no such significance. Even the discovery of a normal anatomical landmark may create anxieties; thus I have been consulted about the ensiform cartilage, which had been taken by the patient for a tumour. There is no end to the fears initiated by trifles, but they are not necessarily trifling fears.

A word about the uncommunicative or inexplicit doctor may not be amiss. He is to be found in all professional groups and among both young and old, but my own experience would suggest—and I have the testimany of many lay and medical observers—that he is, perhaps, more commonly to be found in hospitals than elsewhere. Again and again patients discharged from hospital, when asked what the doctors have told them, say, "Oh, they didn't tell me anything." Often they have spent long periods in the ward and been elaborately investigated, all the time waiting and wondering and uninformed. Could anything be more conducive to the initiation or aggravation of anxiety than experience of this kind? Probably the divided responsibilities which obtain in institutions and the inexperience of house-officers are partly to blame, but the mechanistic, objective character of modern investigations also tends to distract the doctor's from the patients' thought and to direct attention away from private sensibilities and present needs. I have even watched air-raid victims being admitted, examined, X-rayed and transfused without a word of comfort or reassurance being given to them by those concerned.

The pessimistic doctor can also prove singularly unhelpful, however careful and able he may be in other ways.

Case 4.—A very gallant senior officer in the regular army complained of an attack of faintness and of a recurrent "surging sensation" in the region of his heart. Although he did not openly admit or show it, I had no doubt that he was labouring under considerable anxiety. His father had died suddenly from heart-failure at the age of 59. With the help of consultations at intervals I was able to keep him reassured and he continued to indulge in out-of-door pursuits, including golf, shooting and gardening. Later he had occasion to consult a physician in another city (now no longer living), who was well known to me for his diagnostic ability and his gloomy outlook. He examined my patient cardiographically,

revealed evidence of myocardial damage not present on a previous occasion and gave a very guarded prognosis. This was followed by a recurrence of anxiety and a further visit, at which I had to pit my assessment against a less favourable opinion backed now by the revelation of a defect of which I had been happily unaware. The patient continued to lead an active life ; six years later he indulged in winter sports, and he was still alive 16 years after the adverse verdict.

We are all fallible, and I have not the slightest doubt that my own errors and missed opportunities have been numerous. But one hears all too rarely of past mistakes, and I am thus compelled to go to my notes of cases illustrating others' failings. If these can teach us something of practical value, they are surely worthy to be placed on record.

The faults of doctors, it will be seen, are mainly faults of omission and due to lack of time or patience or proper training, and, sometimes, even to a dogged belief that it is "better for patients not to be told too much." It is not so much that their knowledge of a simple human frailty is gravely lacking, as that they fail to apply it regularly and to make its application a main feature of their "cure of souls." But there are faults of commission, too, for which even distinguished leaders of the profession must sometimes accept blame. The teacher at the bedside who drifts too easily into pathological discussion is doubly at fault, for he may at once puzzle or disturb his patient and set a bad example to his class. Sometimes the public utterances of doctors show too little thought for the susceptibilities of the public, who are apt to take as gospel all they say. A distinguished surgeon no longer with us, called upon at a large dinner-party to inaugurate a collection of funds for cancer research, was reported as saying to his audience who were seated at small tables, "Do you realize that in ten years from now one person at each of these tables will be dead from cancer ?" Even if he had statistical justification for so dramatic a pronouncement, it was not psychologically justifiable. The same surgeon advised a young man in his twenties, whom I had advised against an operation for cholecystitis, to have his gall-bladder removed lest it might later undergo cancerous change. The pathological opinion was dubious, the expressed opinion indefensible. On both occasions, a public and a private one, he employed fear as a weapon of persuasion. There are rare occasions on which this weapon may be employed in order to compel a patient to submit to an immediate life-saving treatment, but they are very rare.

The Special Case of Cancer Phobia.

Apart from its high mortality and, in many cases, its relentlessness, cancer has inspired fear in the lay mind because of its supposedly inevitable association with grave pain. We would do our patients and the public a real service if we were to remind them more often, firstly, that cancer in its early stages is to-day more readily recognized and eradicable than ever before, and, secondly, that even when intractable it is by no means always a painful disease ; that carcinoma of the stomach, the liver, and the bowel, for instance, at times may run a painless course, and that when the disease is incurable and accompanied by pain a great deal can be done to relieve it. There are causes of death more miserable than many of the cancers which have become a major

cause of public dread. What to tell the patient who is found to have a cancer and how to tell it is, we well know, a matter calling for the most judicial and humane reflection. The decision varies from case to case, with sex and age, the psychology of the individual, the tractability of the condition, and the estimated prognosis. The manner of the explanation given to relatives also requires the most thoughtful consideration. There are many ways of softening necessary blows, but it is well to insist at all times that there is no case of cancer in which there is "nothing to be done."

Cancer phobia without cancer is, however, far commoner than cancer phobia with cancer. I have carefully perused the notes of 31 cases in which cancer phobia (without cancer) was the specific diagnosis. These must be a mere fraction of the patients seen who harboured the fear in some degree. There were 21 women and 10 men. The average age was 50, the youngest 33 and the oldest 75. Thirteen were described as nervous, very nervous, or as having had a nervous breakdown on one or more occasions. The physical symptoms complained of were generally of a kind associated with emotional disorder. Thus 14, with or without a specific mention of neurosis, were the victims of colonic spasm or other discomforts, of flatulence, globus or rectal spasm, or had had an abdominal exploration. Two patients had duodenal ulcer, and two cholecystitis. One had hyperpiesia. In six cases, all women, there was a complaint of sore or dry tongue or mouth or of altered taste, with no evidence of a local cause for the symptom. In such cases it would seem proper to suspect or enquire for a cancer phobia. In one of these, after completing my examination and while still wondering what could be suggested in the way of treatment, I began by saying, "I am glad to tell you that there are no signs of cancer or any serious disease." "Thank you," came the prompt reply, "that is all I wanted to know." Twelve patients in the series had lost a near relative or friend or neighbour from cancer or had intimate knowledge of a case or cases. Two were in the habit of reading articles in the papers or other literature bearing on cancer.

CASE 5.—A very intelligent middle-aged layman, with expert knowledge of hospital administration, developed a troublesome lumbo-sacral pain after a blow in the back. On a basis of his medical half-knowledge and a vivid imagination, his age, the persistence of his symptom, and a contrast of his present state with his normally good health, he built up an association which seemed to support his fear of cancer. He slept badly and lost a stone in weight. He saw several doctors. He was cured by a single explanation and reassurance. Two years later he was seen for a much slighter anxiety about his heart and again relieved. Later he developed a duodenal ulcer which caused him no serious anxiety and responded to orthodox medical treatment.

CASE 6.—A spinster, aged 70, had twice been treated successfully for rodent ulcers. Her brother had died of cancer of the gullet. Her friends told her that she was getting thin. She had lost a stone in weight, but had taken four years to do so. She was given to reading literature about cancer. There were thus several good causes for her fears.

CASE 7.—A married woman, aged 61, suddenly developed a bitter taste in her mouth, and later cold feelings in the body and slight pains in neck and shoulders. She worried more and more about these symptoms and slept badly. Two distant relatives had recently died of cancer. She had seen a doctor, but had not been

given a complete overhaul or a reassurance of the kind she needed. Eight months later her daughter reported that she had been well from the day of the consultation.

Case 8.—A nervous, unmarried woman, aged 47, and passing through the climacteric, had twice had a nervous breakdown in earlier life. Her mother and paternal grandfather had died of cancer. Two months previously she had begun to worry and to sleep badly because a friend of hers was dying of cancer. Her symptoms included pains in the throat, rectum, and vagina. Three years previously she had had a disease phobia in association with abdominal symptoms.

It will be seen from these histories that the fears which we unearth in our patients are often by no means unreasonable, and that multiple factors are usually at work.

The Fear of Dying.

I have written elsewhere (1940, 1941) of fears of death and dying. In an earlier age when doctrines relating to the after-life conjured grim visions of purgatory and hell, these were, we may presume, an added cause of apprehension. They have their lingering influence still. But to-day people do not on the whole fear death itself so much, excepting in so far as it carries with it the idea of separation from loved ones and of impending hardship for those left behind. Fears of the process of dying, however, are far from rare and are sometimes very real. It is quite commonly supposed that the experience must inevitably involve urgent suffering or pain. This is due largely to the appearances and associations of the moribund state, the " Groanes and Convulsions, and a discoloured Face, and Friends weeping " of Bacon's essay. It is a false inference that such scenes must involve distress for the central player. We have good reason to believe—not only in conditions directly affecting the brain, but also in surgical shock, haemorrhage, pneumonia, congestive heart-failure, septicaemia and many old-age deaths—that the last minutes, hours, and often days, are usually a cloudy period, at the most a time of twilight consciousness. Medical observers who have themselves narrowly escaped death from such causes, and also from sudden accident, rarely admit to any recollection either of bad physical suffering or of fear at the time. The popular view, however, still goes uncontroverted, and novelists and dramatists continue to portray death-bed scenes in a most incorrect way, falsely exaggerating suffering, and generally depicting a clarity of mind in their victims which is quite outside medical experience. No opportunity should be lost, therefore, of explaining to patients discovered or thought to be fearful of the end, and to the relatives of most patients nearing the end, that physical pain and mental anguish, or at any rate keenly appreciated pain and anguish, in this phase are exceptional and, when present, in large measure controllable by appropriate management and drugs. Where good medical and nursing care are available, the occasions which justify euthanasia are infrequent.

The strange and intensely alarming " sense of dying " which accompanies certain nervous and physical states must be clearly distinguished from the " fear of dying." It is—as Clifford Allbutt insisted (1915) and my own numerous observations (1928, 1935) confirm—an organic or physical sensation,

and it may be accompanied by well-defined objective phenomena. It is encountered in a small proportion of cases of angina pectoris and labyrinthine vertigo, in anaphylactic shock and after too large a dose of adrenalin, or perhaps after a proper dose accidentally given into a vein. It is the major presenting symptom in the vaso-vagal attacks of Gowers. It is associated with abrupt changes in blood-pressure such as commonly obtain in all of the above-named conditions, and there are reasons for regarding it as due to a vasomotor disturbance at the medullary level. It is possible that it may sometimes precede death from angina pectoris and anaphylactic shock, although these are, as a rule, so instantaneous that there would scarcely be time for its appreciation. Otherwise, it is consistent, however frequently it may recur, with long life. This aura of mortality is therefore a deceptive omen, and knowledge of this can help to buttress reassurance and assist the treatment of cases. We may not be able to persuade the world so to adapt itself as to believe, with Spinoza, that "a free man thinks of nothing less than of death; and his wisdom is a meditation not of death, but of life"; nevertheless, the liberation of many from needless fears of dissolution and terminal agony is well within our power.

Summary.

1. The fears engendered by disease and ideas and misconceptions relating to disease and its consequences are widespread, and a potent cause both of mental fret and more serious neurosis, often accompanied by physical symptoms.

2. They are, to a large extent, dependent upon ignorance, encouraged by reticence and stimulated by gossip and by widespread commercial enterprise and ill-considered magazine articles, and by fiction and the drama.

3. The medical profession is in part responsible for their frequency. Through inadequate or ill-balanced psychiatric training in the student period and undue reliance on physical remedies, opportunities of relieving minds and bodies are constantly missed. Specialists, whether in organs or in therapeutic methods, tend to distract their own attention from the patient and his total need. More rarely, nosophobia is positively encouraged by unwise medical pronouncements, whether made in private or in public.

4. The extension of simple health education for the general public, especially in early life, could do much to counteract, by promoting an intelligent interest in healthy living, the prevalent disease-consciousness of the present day. Periodic health examinations in youth and afterwards can have a high "reassurance value."

5. A better editing of medical articles for the Press, whether written by doctors or laymen, would be salutary. Recent enactments to ensure a better control of the abuses of the proprietary medicine "racket" have made their contribution, but a more complete control is needed. Few forms of profit-making enterprise are more despicable than those which trade upon fear and unjustified promises, which pander to ignorance, and lead all too frequently to the postponement of accurate diagnosis and appropriate treatment.

Conclusion.

Clinical and sociological studies in the natural history of disease should generally give full scope to objective and numerical methods of enquiry. For this occasion, however, I have chosen a subject not readily adapted to such handling, excepting in so far as careful physical assessments must always be involved. I have done so deliberately, partly because I have so often seen the fears of the sick and injured, in peace and war, go sadly under-estimated, and partly because it is to-day more than ever necessary to strike a just balance between our materialist science on the one hand and our humanist science on the other.

If it were possible to make a survey and a follow-up study of all the cases of nosophobia—major and minor, rational and irrational, of short and long duration—in a given community or practice, we should probably find that a considerable proportion, especially of those developing in young people, undergo resolution with the passage of time and the growth of experience. Others would be found to be relieved by the illness, injury, anaesthetic, or operation which had been feared—the original anxiety often appearing foolish in retrospect. Others again would be quickly cured by the doctor. Only a small proportion would be found to be chronic and incurable. There would still, however, remain another category of cases, possibly exceeding all the rest, in which fears passing undetected would continue at intervals to promote distress of mind and physical symptoms. We cannot, in fact, calibrate the sensations of fear with those of pain, and we should never under-rate the latter, but if frequency and duration rather than degree were the measure of the influence of fears, Sir Philip Sidney's dictum—quoted at the head of this lecture —would, surely, not be extravagant.

As a profession we are losing, in the process of developing our technologies, something of the philosophy, humanism and courage of the older physicians. Our loss of philosophy is shown in our inability to piece together the components of an illness or an individual, to assess the roles of mind and body in morbid experience and to balance the needs of both—in brief, in our inability to see things "whole." Our loss of humanism appears in our too partial success in assessing the psychological needs of the individual and the social needs of the community. Our loss of courage is chiefly manifest in our present-day unwillingness to make pronouncements without subjecting our patients to elaborate investigations. These, while often necessary and valuable, can also prolong anxiety, and leave our own doubts and questions still unanswered. Without courage to accept clinical responsibilities we cannot impart courage to our patients. Without a reasoned clarity in diagnosis and a reasoned hopefulness in prognosis we cannot properly counter fear. In the majority of cases it is possible to give to patients a simple interpretation of symptoms ; a simple idea as to how they should be regarded ; a set of sound reasons should further inquiry become necessary ; a provisional prognosis, in which the emphasis should be on the better chance whenever possible ; and an intelligent plan of action. For the busy practitioner or hospital surgeon or physician, it may well be impossible to devote time and thought to the more profound

psychiatric methods, but there should always be time to examine carefully, to explain clearly, and to reassure as fully as the circumstances allow.

Among the simplest instances of body-mind disorder are states of fear attaching directly to the body and the mind and their mischances. To prevent and treat them effectively in the individual, it is chiefly necessary to remember their existence and ubiquity. For their better control in the community we shall require the aid of education and the law.

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PSYCHIATRIC HYPOTHESIS AND PRACTICE.*

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It is a very great honour to occupy the Presidential Chair of the Psychiatric Section of the Royal Society of Medicine ; it is one which I appreciate most highly, and thank you warmly for.

It has been said that to preach is not merely the ambition, but indeed is in the blood of all Scotsmen, and that in whatever place they find themselves they are apt to think of it as a pulpit, and proceed to deliver a sermon or discourse. I trust that I shall neither be so ambitious nor so dictatorial. In the light of modern psychiatric practice I intend to try to answer in some degree whether it is always necessary, so as to effect progress, that theory and practice should keep in harmony with one another. I am attempting to do this from the point of view of a clinical psychiatrist who has now spent many years in mental hospital work, and has had the privilege of being a consultant and teacher. My contribution, therefore, must be essentially practical, must deal with the issues which have come prominently before me, and must have for its particular aim how most wisely to instruct those undergraduates and post-graduates who are interested in the wider aspects of medical practice, and perhaps in psychiatry as a speciality. To guide them aright is a very serious and responsible task. It means that fairness and discrimination require to be exercised, and that personal experience with the issues involved, whether of an etiological, diagnostic, prognostic or therapeutic nature, is absolutely essential. I have very little patience with those cold intellectualists who, on the basis of this, that, or the other hypothesis develop personal prejudices, constitute themselves into judge and jury, and then, to their own entire satisfaction, proceed to condemn and sentence all their colleagues who do not agree with them. Such an attitude is much too intolerant and arbitrary, and inevitably leads to bias, dissatisfaction, and greater prejudice. Most of us appreciate, the longer we work in psychiatry, how complex and difficult the field is, but nevertheless it has become far more attractive than it was formerly. This is evidenced by the fact that so many more young men and women taking up medical work are keen and enthusiastic to understand more and more about the fundamental aspects of psychiatry, and the psychological factors involved, whether they are going to become psychiatric specialists or not. They are swiftly recognizing that psychiatry has a message, an assured place in the medical hierarchy, and that the study of the whole man in relation to his

* The Presidential Address delivered to the Section of Psychiatry, The Royal Society of Medicine, on 14 October, 1947.

environment constitutes a live dynamic issue which has, as yet, never been successfully grappled with. Yet it is only by pursuing such a course, and such studies, that we are likely to come to that fuller understanding of human conduct which may lead, eventually, to a more harmonious and more stable state of mental health.

I must not, however, press the above argument further, otherwise I should be led into a discussion of the whole problem of mental hygiene, of social psychiatry or "sociatry" as Moreno would prefer to call it, and of all the practical measures of a preventive and social nature which we must pay attention to. Instead I must hasten back to my more specific task. I shall strive to show that although psychiatry has occasionally been a little diffident, shy, wayward and temperamental, yet it has always remained true to the ideal of bringing comfort and care to those distressed in mind or body, and has not been so fickle as some would have us believe. As I have stated previously, I, like many of the rest of you, have had the responsibility of advising and guiding large numbers of students and post-graduates, and at the same time have required to gain and retain the confidence of well-informed medical and surgical colleagues, without whose co-operation progress would have been impossible. Perhaps then you will extend your courtesy to me still further if I venture to be a little personal. Let me add, however, that—

> "I am not one who much or oft delights
> To season my fireside with personal talk,"

but on this occasion amongst psychiatric colleagues and devoted friends I may be pardoned if I subscribe a background to what I have to say.

During my years of psychiatric training and practice I have had an opportunity to read about, listen to, and witness many changing concepts and ideas, I have seen the rise and decline of many forms of therapy, and I may even have taken part in somewhat violent and heated arguments in regard to the significance of this or that particular trend. Here and there we have had our great disappointments. Methods of approach, forms of treatment warmly acclaimed by their enthusiastic adherents have had their brief hour of glory, and then as their limitations have been realized they have tended to sink back into obscurity. But they have not been entirely unavailing; they have been honest failures, because all of them have had for their purpose the idea of progress, the thought that in some way a greater degree of human betterment could be effected, and even although the results may have been transitory, yet they were stepping-stones to further effort. Psychiatrists in general, I believe, have had a fair share of what my friend, Colonel A. D. Stewart, talks about as "disinterested intellectual curiosity"—the inquiring spirit which, I understand, led Archimedes to discover the science of hydrostatics, and Pythagoras to develop and perfect the pentatonic scale. McNeile Dixon, in his Gifford Lectures entitled "The Human Situation," has much to say on the same topic and mentions Pasteur, "who revealed the undreamt of universe of micro-organisms, revolutionizing the whole art of medicine, and Mendel, a simple parish priest, whose name does not even appear in a cyclopaedia of

1891, threw open the gates to the study of heredity, setting forth the laws which govern its mysterious configurations." And then when talking about the unconscious he writes: "The repercussions of the knowledge already gained of this underworld are only beginning to be felt in medicine. It will not end there; they will be felt further afield, in our legal system, in our treatment of social offenders, in our estimates of human conduct. It has only lately dawned on us that transgressors of the social code are as often sufferers as malefactors." It was surely just this same quality of disinterested intellectual curiosity which in recent times led Egas Moniz to formulate his conception of brain function, leading to a surgical operation which has contributed greatly to neurological and psychiatric knowledge. But more of that later. In the meantime let me cast your minds back into the not too remote past.

In 1907, when I was fortunate to obtain a place on Sir Thomas Clouston's staff at the Royal Edinburgh Hospital, I was introduced to a mental hospital organization which had been tried and tested and had not been found wanting. While there I came under the guidance of one of the most brilliant psychiatrists this country has ever produced. I refer to the late Charles Macfie Campbell, who eventually became Director of the Boston Psychopathic Clinic and Professor of Psychiatry at Harvard University. After his initial training in Edinburgh Campbell studied neurology with Pierre Marie in Paris, he worked on brain pathology with Nissl in Heidelberg, and he had received his clinical training in psychiatry with Adolf Meyer at the Psychiatric Institute, Wards Island, New York. He then returned to Edinburgh as an assistant physician at Morningside, and it was at that time that I came under his influence. I remember his infectious enthusiasm, his nimbleness of wit, and his great desire to bring all his great resources to bear in furthering the cause of psychiatry. He introduced me to the clinical formulations of Kraepelin, he laid great emphasis on careful clinical differentiation, and his case reports and summaries were a model of what such things should be. No one associated with him could help being influenced by such a vital personality. That was the period of descriptive psychiatry, when emphasis was laid on the careful recording of signs and symptoms, when the approach was objective rather than subjective, and when all our efforts were bent on correlating the clinical with the pathological. Is it much to be wondered at? You must not forget that in those days padded rooms and strong rooms were used extensively; crude methods of physical treatment by blisters, setons, restraining sheets and excessive sedation were in the ascendant; the nursing staff, particularly at night time, was quite inadequate; and the wards were crowded with noisy and disturbed patients, many of whom, I believe, were manufactured and perpetuated by the methods employed. One of the impressions which remains vividly before me was the large number of cases of general paralysis in various stages of mental and physical deterioration. Many were completely bedridden, bed-sores were not infrequent, a haematoma auris was not difficult to demonstrate, and the grinding of teeth was a noise which had to be heard to be believed. Ford Robertson and his colleagues worked unceasingly to find a cure not only to relieve the suffering, but to decrease the mortality of a disease which ran its

inevitable course in a period of from 2 to 5 years. Death must have been a blessed relief, not only to the patient, but to the sorrowing relatives. Think of the dramatic improvements which have been effected: the supercession of mercury and iodide by salvarsan and salvarsanized serum, the discovery of the *Spirochaeta pallida* in the brain cortex by Noguchi and Moore, and ultimately the successful treatment by malarial inoculation introduced by Wagner-Jauregg. The mere recording of the above facts gives no idea of the excitement which participation in such work caused. We had been taught that before a diagnosis of general paralysis could be made, inflammatory and degenerative changes must have occurred to such an extent in the cells of the brain cortex that readjustment was impossible, and that this applied just as much to the early acute clinical cases as to those who had had a more protracted course. The procurator-fiscal of Glasgow became so disturbed by the death of one or two patients who had been receiving malarial treatment that he regarded malarial treatment as a more or less criminal procedure, and unjustifiable. He threatened proceedings against those carrying it on. Yet what a revolution has been effected; cases of general paralysis in our mental hospitals are gradually disappearing, and the scepticism which many of us had regarding the effect of treatment has practically disappeared. The hypothetical and therapeutic pessimism which was based on pathological fact had to give way to the wonderful results which were effected.

Another impression which remains before me is the impetus and drive which existed in the Psychiatric Institute Service, Wards Island, New York, under the direction of Adolf Meyer, and later of August Hoch. Meyer had succeeded Van Gieson, and had insisted that the Institute, if it were to function effectively, must have associated clinical facilities. In consequence two wards were put under his supervision, the female ward catering especially for affective and ideational disorders, the male ward for organic states of all types. The clinical material was rich both in quality and quantity, and the Institute came to form the training centre for the New York State Hospital system, and set a standard which has never been surpassed. It was while he was there, and later at the Phipps Clinic, Baltimore, that Meyer did his epoch-making work on the Fundamental Aspects of Dementia Praecox, on his Reaction Types, and on the development of his concept of Psycho-biology. Hoch and Amsden added their quota by their analysis of personality types. It was about the same time that Freud and Jung introduced their psycho-analytic concepts into the United States by delivering a series of lectures—the Clark University Lectures at Worcester, Massachusetts. As one looks back now and considers the discussions and controversies which occurred then, the violent antipathies and prejudices, the personal acrimony, and then gradually the appreciation that even although the therapeutic results were in many cases disappointing, one realises a system of philosophy and psychology had been built up which is likely to be enduring, and which eventually may lead to further developments. The analysis of dreams, the interpretation of symbols, the application of free association and the elaboration of the association method have all been techniques, and methods of investigation which have meant a great deal in the progress and development of preventive psychiatry, but most

of us, I believe, will agree that so far as successful therapeutic results are concerned, hypothesis has largely outdistanced practice.

Again we do well to remember some of the other great personalities of that period: the business-like, thorough Kraepelin; the impressive Alzheimer with his kindly manner and vast knowledge; the ever youthful, active Bleuler; the enterprising and imaginative Southard, who suggested that areas of gliosis in the brain of dementia praecox cases might be palpated. It was during this same period that we witnessed the development of organized occupational therapy, of intelligence testing, of industrial psychiatry, and of psychiatric social service, all of which have contributed so much to individual, family and social betterment.

Furthermore—and perhaps more important than anything that has been mentioned so far—we have seen the greater emphasis of psychiatry in our medical schools, in the out-patient departments of general hospitals, in the establishment of special clinics, and in association with mental hygiene associations. And when I think of the International Association of Mental Hygiene, and of how it came into being, that intrepid courageous man Clifford Beers comes to my mind. Beers—the founder of mental hygiene—used to ask himself the question: "Why has my life been spared?" If any of us could give half as good an answer as Beers did we would be amply satisfied. As a result of all the above developments we are entitled to claim that never before has psychiatry been on so active and potentially so fruitful a basis.

But even with all the progress which has been made, there are still vast unexplored territories of mental functioning which require still greater research and investigation. We need not be unduly worried if the approach comes first from one angle, and then from another, if it should swing from the physiological to the psychological—each is supplementary to the other—and therefore we need not be discouraged by our critics, who are always so ready to inform us that psychiatry does not know where it stands. It is only a very foolish and myopic person who sticks obstinately to one point of view; the really strong, intelligent one is willing to be converted by the results obtained, whether by drug-therapy, psycho-therapy, insulin, electric shock, or leucotomy. The important thing is to study one's results carefully, and to regard every new procedure as a matter for further research and investigation rather than as a cure-all for all the psychiatric ills which man is heir to.

A good many years have now elapsed since the "new" physical methods of treatment were introduced, and an attempt should be made to evaluate or estimate where we stand to-day. Most psychiatrists who have used those methods must have passed through periods of considerable anxiety and self-questioning as to how far they were justified in advocating such procedures, or of agreeing to them, either because of the evident distress of the patient, or because of the insistence of relatives, who not unnaturally feel that something more should be done to try to alleviate the obvious suffering. Those who are older amongst us, and who have been accustomed to rely on a degree of psychological insight backed up by sympathetic understanding on the *vis medicatrix naturae*, and on good nursing and general medical care, have tended to be very sceptical regarding the introduction of insulin coma, cardiazol, narco-analysis,

prolonged sleep, electric shock and leucotomy, but the results obtained have been so impressive not only from the point of view of cure, but of alleviation, that we are forced to examine the whole position most carefully. I do not intend to analyse all the above-mentioned forms of treatment, but to direct my remarks particularly to leucotomy. While preparing this paper I was interested to see that Dr. E. L. Hutton (*Journal of Mental Science*, April, 1947) has expressed a similar point of view, has discussed the contra-indications for leucotomy, and has shown that enthusiasm should be tempered with sober consideration. She has reported that there are a few patients " whose behavour following the operation is definitely less satisfactory that it was at the height of their illness " ; undesirable traits have also been noted in cases which can be regarded as successful. She believes that the basic character and outstanding traits of the total personality are more important in assessing the probable result of the operation than the particular type of mental disorder from which the patient is suffering. Dr. Hutton's opinion fits in with my experience, and for some time I have wondered whether the long-term results have justified the transitory improvements and the methods employed. It is obvious that we should not be carried away by unbounded enthusiasm, nor yet should we be daunted by our adverse critics, many of whom have little or no appreciation of the distress of mentally ill patients or of their relatives, nor the great medical and nursing strain involved in safeguarding and treating patients who have often regressed to a primitive level. I seem, however, to sense a certain danger in Dr. Hutton's statement when she rather minimizes the importance of clinical differentiation. There are still, unfortunately, both research workers and clinicians in psychiatry who are inclined to regard the nervous and mentally disordered as belonging to one category. They think too much in terms of the actual brain structure or lesion, of insanity *sui generis*, and not enough of the actual understanding of the human material with which they are dealing. We need more and more clinical differentiation rather than less and less. It is only right, of course, that our aim should be directed towards finding a common reason or explanation for the successes—partial though they may be—which have been attained, but this is more likely to be done if the research worker and the clinician work closely with one another, rather than in somewhat different camps. It is, I believe, largely because of faulty clinical differentiation that our results are sometimes difficult to assess, and come under adverse criticism. We need our more psychologically minded, our more bio-chemically minded or our more neurologically minded colleagues alongside. Their caustic comments are sometimes extremely good for us. For instance in *Brain*, **70**, 1947, the following appeared : " We read that the prefrontal or forward part of the frontal lobe is concerned with thought, but its precise functions are obscure ; it is very difficult to establish the relationship between such aspects of thought as imagination, initiative and self-consciousness on the one hand, and any given part of the brain on the other." Yet if this psycho-anatomical result is not achieved, the operation nevertheless is designed to " break the connection between the patient's thoughts and his emotions ; and it does this by severing the fronto-thalamic radiations, and ensuring degeneration of the dorsomedial nucleus of the thalamus. We learn later, however, that the

operation may yet be successful even when it achieves neither of those anatomical results, and it remains therefore an empirical procedure producing its results—when it does—in an inexplicable fashion." Despite the above comment I note that Burlingame, in an Editorial Comment in the *Digest of Neurology and Psychiatry* (August, 1947), states that it was the symposium on the functions of the frontal lobe at the second International Neurological Congress in London in 1935 which encouraged Moniz to develop the idea that the interruption of the frontal association pathways of the brain might lead to the relief of certain psychotic symptoms. It was at that Congress that Goldstein discussed the relations between the frontal lobes and psychic functions. He stated that there was ample evidence to show that lesions of the frontal lobe, especially if they occurred on the left side, were associated with psychic disturbances, which were not necessarily limited to a single mental function. At the same Congress, Brickner stated that the functions of the frontal lobes were concerned with the production of "ingenuity"; but more than ingenuity was required if man was to achieve a harmonious and intelligent control over his emotions. (*Lancet*, 10 August, 1935.) Furthermore Gordon Holmes and others have described cases of moral perversion as occurring in frontal lobe tumour, while Richter and Hines have demonstrated that the conduct of macaques was controlled through the prefrontal lobe, particularly Area 9 (Brodmann), and also through the striatum.

It can be seen, then, that the selection of the fronto-thalamic association tracts was not so strange and arbitrary a procedure as some have been inclined to think, but rather was it a brilliant piece of inductive reasoning—"disinterested intellectual curiosity"—which has given magnificent clinical results.

As an aside may I refer to an amusing editorial which a few days ago was published in the *Scotsman*, and was entitled "Trail of the Snail." The writer mentions how the disinterested pursuit of knowledge may turn into strange channels, and comments especially on how research workers in the University of Maryland have recently established the fact that a snail advances at the speed of .000363005 miles an hour. "It is difficult to visualize a group of grown men spending their time recording with a delicate apparatus the speed at which a solitary snail moves over the surface of the restless earth. Snail pacing must be among the most boring occupations ever undertaken by man. . . . Men who collect Ph.D.'s for plotting the pace of a snail are not the kind of men to blow up the world's fuses. . . . No psychologist has ever determined how timid a mouse is. . . . Amnesia among elephants is also a subject on which there is a good deal of loose talk. . . . No one has ever positively declared how slippery an eel is."

We must take care, therefore, not to be led up the garden path, and we must remain watchful because subtle suggestions are constantly coming to us from a variety of sources. For instance Meyer, Beck and McLardy (*Brain*, **70**, 1947) state: "An operation on human beings producing a brain lesion unpredictable in precise location and extent is, from a purely anatomical point of view, an unqualified boon, since each case, and often each hemisphere, presents as it were a separate experiment." It is, indeed, an ill wind that

blows nobody any good—and while our psycho-physical correlations, imaginations and practice may be sadly lacking in precision, logic, thoughtfulness, yet our empirical results and operations are helping to keep alive the enthusiasm of the neuro-pathologist, as well as the critical acumen of the clinical neurologist. All I would say is that we must be careful not to sacrifice our patients on the altar of science. We are being urged to do it all the time. For instance it has been asserted that the after-results in cases treated by means of insulin or other shock methods are better than in those who have made a spontaneous recovery, and that statement is based on the suggestion that the former method is so much quicker, and anticipates emotional deterioration. Again, Freeman and Watts (*Journal of Nervous and Mental Disorders*, **105**, 3, March, 1947) say: "The main indication for psycho-surgery is emotional tension that is of great severity, threatening the patient with disability and suicide, and for which no other treatment is effective—it seems to matter very little what the diagnostic label is, or how long the tension has been present. Since certain patients, particularly schizophrenics, seem to lose their tension relatively easily, it is wise not to wait too long in the expectation that improvement will occur through the process of emotional deterioration." I maintain that here again we are meeting with advice and argument which is tendentious and dangerous. On the one hand we are urged not to bother too much about clinical diagnosis but to act quickly, even precipitately, and rather to have the betterment occur through the emotional deterioration produced post-operatively than by natural and spontaneous means. If I could gauge the recovery, even with a certain amount of emotional blunting, of a schizophrenic or any other type of case, I would prefer that situation to one produced artificially by operation. In connection with the above arguments I have been impressed by Salzman's paper on Evaluation of Shock Therapy (*American Journal of Psychiatry*, **103**, No. 5, March, 1947), when he points out that too little stress has been laid on the possible deteriorating effects on the personality of the individual. We should, he says, distinguish between the immediate remission rate and the long-term result, and in support of his argument quotes the results of Rennie and Ebaugh. Rennie reported that the remission rate in dementia praecox dropped in $3\frac{1}{2}$ years from 55 per cent. to 32·8 per cent., and in manic-depressives in the same period from 75·5 per cent. to 55·8 per cent. Ebaugh using insulin noted a remission rate fall from 63·5 per cent. to 48·2 per cent. in one year.

Salzman also draws attention to the very high readmission rate in patients who have been treated with shock treatment, and believes that this finding largely nullifies the conclusions expressed by others in relation to the economy effected by such treatment. Of 152 patients readmitted to St. Elizabeth's Hospital, Washington, 44 dementia praecox patients had received shock treatment and 45 had not. In the shock-treated cases the average readmission interval was 1·6 years, whereas in the non-treated cases the average readmission interval was 4·5 years. Thirty manic-depressive patients had received shock treatment and 33 had not; the former showed an average readmission interval of 1·4 years, while in the case of the non-shock treated cases the interval was 4·36 years. His general conclusion was to the effect that the larger the number

of shocks the earlier the readmission. Whether or not you agree with Salzman's findings, you will no doubt be impressed by the fact that there is very little justification for the unnecessarily early and sometimes even precipitate and indiscriminate use of shock methods.

For my part I can say that Salzman's experience and results confirm the impression we have formed at Morningside. We have always maintained the necessity of great care in coming to an accurate clinical diagnosis ; sufficient time to allow of spontaneous recovery, irrespective of the difficulties of management ; careful evaluation of the amount of treatment given ; and cessation of treatment as soon as an adequate result has been obtained, rather than pursue it needlessly in the false hope that by giving more treatment the recovery will be made more secure. If we do not obtain a result with the maximum number of 12 shocks we discontinue it, and have recourse to more pedestrian methods.

And now again, if I have not side-tracked the issues too far, let me return to the more specific consideration of leucotomy, of when and how to use it, of its contra-indications, and of whether or not it is completely justifiable. These considerations are based on experience with 100 cases which were operated on by Mr. George Alexander, Senior Surgeon to Mr. Norman Dott's neurosurgical unit. It is not necessary for me to review the literature because I realize that it is very familiar to most of you, but in passing I would merely like to say how striking and impressive it is. The reports of Ziegler, Freeman and Watts, Cunningham Dax, Cook, Frank, Ström-Olsen, Hutton, Golla, Berliner, Moore, and a number of others plus the comprehensive survey by the Board of Control tell a most wonderful story, and must carry conviction to everyone except the hopelessly prejudiced.

The criteria which I have utilized in coming to an opinion as to whether or not such an operation was justifiable are as follows :

1. Duration of the illness.

2. Degree of tension or affect.

3. The seeming impossibility of obtaining betterment by any other means.

In the discussions I had heard in relation to this operation, previous to adopting it, I had not been impressed either by the results or by the type of patient selected for such treatment. I was extremely sceptical regarding the advisability of carrying out a blind operation on a delicate structure such as the brain in the hope that the personality of a distressed, disturbed, aggressive, deteriorated patient could be re-integrated. It was not long, however, before I became completely converted, and recognized that a change and betterment could be effected which surpassed my wildest dreams and expectations. My " disinterested intellectual curiosity " was satisfied, and has remained satisfied ever since. Let me record our results quite briefly and summarily and then discuss certain salient features :

TABLE I.—*Results in* 100 *Cases.*

Diagnosis.	Social Recovery.	Improved.	Unchanged.	Died.	Total.
Schizophrenia	12	20	18	1	51
Paranoid states	9	11	2	1	23
Involutional melancholia	6	2	—	—	8
Obsessional neurosis	7	1	—	—	8
Psychopathic states	—	3	1	—	4
Manic-depressives	1	2	—	—	3
Agitated depression	1	—	—	—	1
Mental defect	—	1	—	—	1
Encephalitis	—	—	1	—	1
	36	40	22	2	100

Apart from any personal comments which I might care to make regarding the transformation which has been effected in the above disturbed, distressed and often violent patients, whose illness had in the majority of cases been of many years' duration and appeared intractable, I would prefer that you should listen to extracts from a number of letters which I have selected from those sent by grateful relations.

1. " I am very happy to report that things have been going considerably better than my wildest expectations. My wife has been absolutely normal in practically every respect. She is happy as the day is long. She has much improved in her interest in the children, and her general attitude to them, though she is still a bit sharp with them on occasions. She gets on well with the household staff and has worked in very well with our new Nanny. She is now much more normal when meeting strangers than she was when she first came home, and in fact in every way it is possible for me to give a most excellent report. I cannot start to put into words what all this has meant to me."

2. "After her long illness I am very pleased to inform you that my sister is doing very well. She is living in her own home with her daughter. She attends to all her household duties, conducts all her own business personally, converses freely, and takes an interest in the daily news. She does her own shopping and understands the ration books."

3. " My son has kept well since he left Craig House in May, 1946. He has been doing horticultural work for four or five months and has settled down to it well. None of his bad symptoms have reappeared, though sometimes he is a bit forgetful. He is still somewhat solitary in his habits, and in regard to strangers is inclined to be shy."

4. " I am happy to say my daughter is keeping very well, and since she was discharged from the institution she has never looked back. If you care to see her I could bring her in any day any time to suit your convenience (Monday excepted) as she is being her sister's bridesmaid on that date."

5. " I am very glad to say my sister is now quite normal. She is just her old self again. She can go to her bank in a taxi alone and draw a cheque, also she can go shopping alone, and sometimes she goes for a walk by herself and enjoys it immensely. She takes an interest in the domestic affairs of the house, and also she has planted bulbs and plants in our garden here—she is very interested in gardening.

" She is gracious and delightful with friends, she is very pleased to see them and gives them a charming welcome. She loves going for a car run into the country. No one ever had a more loving or a more devoted sister, and so far she is so very, very happy that it is a joy to see her."

6. " My daughter is very well. I rang up the family doctor to tell him of your letter and he replied : ' Tell him that I think her case remarkable, and that she is perfectly normal in every way.' I certainly say so also. She is just quite normal. She is the greatest help—takes an interest in the house, garden, and chickens, and does my shopping. She knits, sews and reads. I noticed that she got interested in papers and books gradually after being home for some time. She has been of the greatest help to her nephew, a boy 1½ years old—took him out each day, and often took him entirely out of his mother's hands."

7. " In my opinion my daughter's operation was a most wonderful success. She is now physically strong, and with regard to her mental condition I have not perceived any abnormality whatever. She is attending a training college with a view to becoming a teacher, and has been taking part in short spells of practical teaching. There are, of course, certain traits in her behaviour which a critical observer might find fault with—untidiness and a tendency to ingratitude and expecting everyone to serve her (but these showed themselves before her illness), excessive cigarette smoking, which might indicate a certain lack of self-control. But she is now 27 years old, and if at the close of her present training she is able to stand on her own feet, I think she will gradually correct and overcome these faults. I, personally, am deeply grateful to you."

I have in my possession many other letters of much the same tenour, and they all amply demonstrate the great benefit which has been effected so far as the patient is concerned, and the immense relief and gratitude of the relatives. Even in those cases in which social recovery and discharge cannot be related, yet the improvement in certain cases has been so extraordinary that numerous patients are now able to lead a life of usefulness and contentment under hospital conditions which formerly was denied to them. I shall content myself by giving two instances :

1. A young man, 28 years old, was admitted on 11 June, 1942, to the Royal Edinburgh Hospital for Nervous and Mental Disorders. He was regarded as a mental defective who had exhibited violent and dangerous propensities. A short summary of his life record is as follows :

He was educated in an Industrial (Approved) School to which he had been sent for stealing. After leaving the Industrial School at the age of 16 he was found, on account of his impulsive conduct to be unemployable. When 19 years old he was charged with attempted bag-snatching and was put on probation for one year. A few months later he broke his probation and was fined 10*s.* or 5 days' imprisonment. During the same year he was charged with theft and was sentenced to three years' Borstal treatment. While there he was described as impulsive, destructive, mendacious, a runaway.

When 20 years old he was considered unsuitable for Borstal treatment, was certified as a mental defective, and transferred to an appropriate institution.

During the following years his conduct is described in the following terms : Very violent, aggressive and destructive, constantly provoking other patients ; on one occasion leapt through a stair-case window. At times he appeared to be hallucinated and delusional ; he attacked several patients and attendants ; he required constant supervision and sedative therapy. In April, 1942, he made a sudden, vicious, homicidal attack on a fellow patient with a pick-axe. That incident was reported to the Procurator-Fiscal, and the Crown authorities recommended his certification as a person of unsound mind.

From June, 1942, until July, 1945, when leucotomy was performed by Mr. George Alexander, he continued in a violent, destructive, unco-operative state. He was frequently controlled by restraining sheets and by almost continuous sedation.

Following the operation he co-operated well in his treatment, did not interfere with the head dressing, and eventually allowed the sutures to be removed without demur. Seven days after the operation he was reacting to auditory hallucinations ; he said that " voices " spoke to him, that people were trying to make a fool of him

and that he was being encouraged to smash things up. He managed, however, to maintain his self-control.

Since that time he has maintained a continued improvement. He is happy and biddable, he is friendly with his fellow-patients and the staff, and he is proving a useful member of the garden staff.

2. A young man, 26 years old, was admitted in August, 1945, to the Royal Edinburgh Hospital for Nervous and Mental Disorders. I had been interested in this young man for approximately nine years, as I had seen and examined him on numerous occasions at the instance of the Procurator-Fiscal. He had been charged repeatedly for lewd practices towards young children. On occasions he had served a prison sentence, but on other occasions he had been a patient in a mental hospital, either voluntarily or under certificate.

He came from a poor stock; he had a fractured skull when seven years old, and a year or two later contracted a severe attack of scarlet fever with subsequent cardiac involvement. He had, however, made good progress at school, he was of average intellectual attainment, but his work record had been deplorable. He changed from job to job largely on account of his aggressiveness and bad temper. At home he was threatening towards his family, and on many occasions vowed that he would injure himself or others. I had many talks with him, during which he expressed great remorse for his conduct, but he felt that he was completely controlled by his over-mastering impulses, and he pled repeatedly that some course should be taken so as to assist him to modify and control his conduct in the hope that he would cease to be a public nuisance.

Eventually, after much thought, I decided to recommend a leucotomy, and this was performed in December, 1945.

Following the operation he was confused, out of touch with his surroundings, interfered with his bandages, was incontinent of urine and faeces. He took longer than usual to convalesce from the operation, and it was not until 16 days after it that he was able to co-operate satisfactorily in an examination. He has not recovered from the point of view of earning his living or of being independent, but he has become a quiet, steady patient who has been freed from impulsive outbursts and has been able to work industriously in the Occupational Therapy Department. He has far greater confidence in himself than formerly, and eventually it may be possible to sanction his discharge in the hope that he will be better able to restrain his sexual impulses than previously.

There are many other cases which I would like to discuss and draw attention to, but I have picked out those two cases purposely because they illustrate the difficult question of how and where mental deficiency, psychopathy and insanity end and where delinquency and criminal conduct begin. The results obtained by means of operation have been most impressive, because a state of peace and relative contentment has replaced one of turmoil and discontent. The suggestions which arise in my mind as a result of my experience with those two cases have taken this form:

1. Would not many delinquents, who realize how unhappy and unsatisfactory their lives are, not readily accept this form of treatment in the hope that they would be greatly benefited?

2. Do such results not constitute a strong argument towards the adoption of a strong psychiatric service in our prison system?

3. Would it not be possible to suggest to the Legislature that sufficient evidence has now accumulated to enable us to recommend leucotomy in certain cases, not as an alternative to, but as an adjunct to prison treatment?

4. Would the psychotherapy of the delinquent not be more effective and satisfactory once a leucotomy, in certain selected cases, had been carried out?

No doubt others might formulate other and better questions along similar

lines, and if this were done, would they not constitute a valid reason for medico-legal discussions in which the arguments, *pro et contra*, could be seriously canvassed? It would, of course, be at once suggested that there might be cases in which the patient's conduct had been aggravated rather than helped by the operation, and while there may be such individual instances, yet I believe, from my experience, that they are comparatively few in number; in any case, both mental hospital and prison treatment by themselves not infrequently lead to considerable deterioration. I feel convinced that any fair-minded person, whether judge or physician, with the interest of the individual and the welfare of the public at heart, might welcome the suggestion I have made.

In addition to what has been said there are a few other points which I would like to draw attention to.

The mere statement of discharges and improvements, wonderful as the figures are, does not do full justice to the results obtained. It cannot be too strongly emphasized that the vast majority of the cases operated upon were persons who had had every conceivable form of treatment previously, whose illness had been of a prolonged and desperate nature, and where a good result, judging from one's past experience, had seemed impossible. In contrast the results have been far beyond my expectations, and have convinced me that in suitable cases the operation of leucotomy is not only justifiable, but advisable. Our mortality rate has been 2 per cent., our post-operative epilepsy rate has been approximately 7 per cent., but the epileptic manifestations have been very infrequent and episodic, and have not given cause for any alarm.

Our figures show one interesting contrast. In the Royal Edinburgh Hospital we have separate departments, Craig House and West House, which cater for people in a somewhat different social and economic position. At Craig House we have the patients able to afford the higher rates of board, whereas at West House we have a number of rate-aided patients and those paying relatively small rates of board. At Jordanburn Hospital we deal only with psychoneurotic cases. Table II illustrates the results obtained in the different departments:

TABLE II.

	Discharges.	Improved.	Unchanged.	Deaths.	Total.
Craig House	24	13	7	1	45
West House	10	27	15	1	53
Jordanburn	2	—	—	—	2
	36	40	22	2	100

It is, of course, obvious enough that we should not read too much meaning into the above results, but the far greater discharge rate among the Craig House patients is very striking; it may be that those with rather better social, intellectual and economic resources have the more satisfactory prognosis.

Another contrast which is worth commenting on, and which I have not seen especially mentioned, is that existing between men and women.

TABLE III.—*Results in Men and Women.*

	No.	Discharges.	Improved.	Unchanged.	Deaths.
Men	53	15	21	15	2
Women	47	21	17	9	—

The larger social recovery rate in the case of women is quite marked, and is what might be reasonably expected, because tension states are rather more frequent and severe in them than in the case of men.

Leucotomy has now been given so extensive a trial in so many hospitals and clinics that I believe the time has come when it should be utilized in suitable cases, but always with great discrimination, and not in any spirit of merely giving the patient a chance. The chance should be based on accurate clinical diagnosis, on a careful study of the literature, and in the belief that, despite the severity and duration of the illness, sufficient of the personality has been left intact so that a reasonable reintegration may be expected. That would seem to be an infinitely safer plan than to attempt to proportion the extent of the operation to the severity of the clinical state as Freeman and Watts have suggested. In consequence all the cases presented in this series have been subjected to the closest clinical scrutiny, and I have come to agree with the view expressed by Frank (*Journal of Mental Science*, 1946) that leucotomy is contra-indicated in cases of schizophrenia with a shallow affect and an insidious development. I would, however, enlarge that category, and would suggest that all cases immature or lacking in emotional development, the constitutionally loaded, the chronic invalid reaction types, are those in which a satisfactory result can hardly be expected. A man, whom I saw originally in 1938, who took an unfavourable view of his prospects, was given intensive courses of insulin coma, cardiazol, electric shock and then, following a leucotomy, he took his own life because he believed that he would never regain a sense of confidence and efficiency, and because he believed that all forms of treatment had been exhausted. In my opinion he was the type of person who would have been more satisfactorily dealt with by constant and persistent encouragement and reassurance rather than by any form of physical treatment. I have mentioned the case to serve as a warning, and as a plea for the greatest discrimination in deciding for and against operation. So far as our cases of schizophrenia have been concerned, practically all those in whom a favourable result was obtained were cases in which exogenous etiological factors had been prominent, and in which a considerable paranoid colouring was present. It was not sufficient to warrant a transfer of the case to the group of paranoid states, but it was sufficiently prominent to remind one of the abortive paranoiacs of Friedman and Gaupp, of the querulants of Specht, and of the periodic paranoid states of Bleuler. Such symptoms may be pointers to more intensive and accurate diagnostic analysis. I feel perfectly certain in any event that the majority of conditions formerly known as paranoid schizophrenias should be regarded as paranoid states purely, and not necessarily related to schizophrenia at all; many of them have a much closer affiliation to manic-depressive episodes than to schizophrenia. I consider that our results with paranoid, involutional, and obsessive states have been outstandingly good.

There are many other points which could be discussed in detail, and where perhaps one might take a rather different view-point than has been expressed by others, but this is not the time or the occasion to be controversial, and there is still so much unknown that it is wiser not to be dogmatic, but rather to recognize that it will take many years yet before we have accumulated all the information to enable us to come to clearer and better formulations. I at least am satisfied from my personal experience, and no one can rob me of it, that in leucotomy we have a means of benefiting many persons to such a degree that, irrespective of a failure here and there, a great advance in the treatment of otherwise intractable conditions has been effected. It may be quite true to argue that the hypothesis which has led to any of those forms of physical treatment in which such magnificent results have been obtained is faulty, but it should likewise be remembered that it was while acting on a wrong hypothesis that Columbus discovered America. Taking everything into consideration, I will feel infinitely more satisfied by my contribution to psychological medicine if I can continue to promote results and recoveries on a faulty hypothetical basis rather than remain inactive because of it, but the matter cannot be left there.

We must continue to strive for greater accuracy, for the closer approximation of hypothesis and practice. That, however, does not alter the fact that I believe that medicine is largely empirical. There is nothing antagonistic between the science of medicine and empiricism, because empiricism (meaning experiment, experience) must always act as a stimulus to more research and investigation. Whether the practice of medicine will ever become an exact science is extremely doubtful. There are too many variables, and every person is, more or less, a law to himself. It is for that reason that in the practice of our art we cannot afford to wait until scientific theory and fact have been established. Indeed Dyce Duckworth (*International Clinics*, **4**, 1911) once stated that he believed that the public, in certain instances, prefer the medical artist to the medical scientist, and he added: "There must be good reasons for this preference." Let us therefore not frown on, but ardently encourage the development of that intuitive judgment which Dr. John Brown called the "Nearness of the Nous" or presence of mind; it is, I believe, a more valuable asset in the understanding and treatment of our fellow citizens than intellectualism, logic and rhetoric.

PSYCHIATRIC DISORDERS AMONG THE CHRONIC SICK IN HOSPITAL.*

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Introduction.

The Admission of Aged Psychiatric Patients to Institutions.

It has recently been pointed out (Lewis, 1946) that between the years 1907 and 1937 the number of first-attack admissions of patients of 65 years and over, into the mental hospitals of England and Wales, differs considerably from analogous American figures. In Britain, using statistics supplied by the Board of Control for England and Wales, there was a marked tendency for the incidence of this group to decline, whereas in America, using statistics from New York Mental Hospitals Board, there was a marked increase. An explanation is found in the assumption that in England large numbers of cases which would be relevant to the statistics, were looked after in other institutions or at home, whereas in America less alternative accommodation was provided. It is doubtful, had the investigation been continued up to the present date, if the statistical divergence would have been found to continue. The incidence of first-attack admissions of those over 65 has, of course, a more subtle significance than a simple admission-rate for an age-group, or even a first-admission-rate, but the present impression in British Mental Hospitals is that admission of old persons—even first-attack admissions—has increased, especially during the war years. Post (1942) demonstrated this rising incidence of aged patients by analysing the admissions to Edinburgh Royal Mental Hospital from 1904 to 1942.

The number of aged and long-term sick suffering from either physical or mental disorders who could be looked after at home during the war years was much reduced by the mobilization of the female sex for war work, and the number who could be attended in nursing homes and local hospitals was also reduced by the recruitment of nurses for the armed forces. The hospitals, too, suffered reduction in numbers by being reserved for emergency purposes and by war damage. The result has been that British mental hospitals have been asked to find accommodation for many older persons who in pre-war days would have been nursed elsewhere. These changes occurring since 1937 support Lewis's explanation of the statistical differences between the two countries' 1907–1937 reports. Lewis suggests that the bulk of the patients not accounted for in the British statistics were to be found in the Public Assis-

* A paper awarded the Bronze Medal for 1947 by the Royal Medico-Psychological Association.

tance Institutions throughout the country. This he has confirmed by superficial clinical observations and by reference to the London County Council's statistics for these institutions. In the year 1932 roughly 28 per cent. of the cases in what used to be called the "workhouse" were mentally disordered, and about 12 per cent. were labelled "senile dementia." These patients were outwith the inspection and statistical investigation of the Board of Control.

The account which follows gives some clinical details of the cases found in some equivalent modern institutions for the chronic sick and demonstrates a higher incidence of mental disorders than the figures mentioned.

The Type of Hospital Investigated.

The advent of the Local Government Act (1929) removed the term "workhouse" and brought the institutions so-called from the control of the "Boards of Guardians of the Poor" into the hands of the Public Assistance Committees of the Local Authorities. The buildings consisted usually of casual wards with arrangements for work, the "house" which had sitting and sleeping accommodation with airing and exercise courts, and the infirmary for the sick and bedridden. The officials were the Master, the Matron and the Medical Officer. Apart from the labour arrangements for casuals, many institutions still remain organized in this way, while others have evolved to a varying degree. Some authorities have increased the hospital accommodation by taking over all the buildings for the treatment of the sick, while others have gone a step further and passed the institution over to the Public Health Committee for management. No matter whether governed by the Public Assistance (now in some cases the Social Welfare Committee) or by the Public Health Committee, these buildings have generally been adapted and altered, though not always satisfactorily, into hospitals which house for the most part chronic sick medical cases. Any new building has usually been used for acute and maternity work.

The changes in the name and management have, in some cases, been followed by a high standard of medical work and care, but the Regional Hospital Surveys (1946) have revealed great deficiencies both in the accommodation and services provided throughout the country for chronic sick people. It is easily confirmed that large numbers of psychiatric cases occur in these hospitals, though arrangements for them as such are rarely undertaken. The result in some instances is that in the same ward cases of chronic heart failure, rheumatoid arthritis, senile dementia, diplegia with congenital deficiency and even relatively healthy, but paranoid personalities are to be found. The physically ill are therefore subjected to added mental discomfiture and the mentally ill do not obtain the investigation and facilities which are due to them. It is only just to remark here that the Regional Surveyors also recorded instances in which ample and good provision was made for the chronic sick.

Procedure of Investigation.

A survey was undertaken to discover the proportion of the various types of physical and mental conditions found among the chronic-sick patients who were to be found in a group of institutions supplying the hospital accommodation

for this type of case in a city of 500,000 inhabitants. It was anticipated that recommendations for changes in management and conditions for the patients would materialize from a study of the information obtained.

Patients were examined in five hospitals (825 beds) governed by the Local Authority Public Health Committee which was progressive in its views. Three of the hospitals admitted chronic-sick only, while others contained maternity and tuberculosis beds in addition. Psychiatric cases were not admitted as such, though aged persons were not refused admission because mental symptoms were included in their ailments. A total of 788 patients were examined. In each case sociological, physical and mental aspects were investigated. The patient was examined physically with a view to finding the extent of the functional incapacity in relation to sight, speech, hearing, walking, etc., and the underlying disease. A psychiatric examination was undertaken to estimate the mental dysfunction and any individual peculiarities which might have a bearing on the nursing of the patient. Information was available from the patient's records and from the nursing staff, who were able to give an account of the patient's behaviour over a long period in most cases. An account of the findings of the survey has been published (Affleck, 1947) in which it was demonstrated that central nervous system lesions, senile weakness, arthritis and chronic bronchitis were the most numerous physical conditions accounting for the patient's admission to hospital. In the social aspect, widows and single people predominated and home and family disruption by war-time events were frequently encountered. A more detailed analysis of the psychiatric findings is now presented.

Psychiatric Findings.

A. *Incidence.*

1. *General.*—37·3 per cent. of 788 patients examined (552 women and 236 men) had some form of mental disorder. The sexes were nearly equally affected. The incidence in the main age-groups is shown in Table I.

Table I.—*Total Patients and Incidence of Mental Disorder.*

	Number.	Total. Per cent.	Male. Number.	Male. Per cent.	Female. Number.	Female. Per cent.
Among all patients	294/788	37·3	92/236	38·9	202/552	36·6
,, those over 65	221/628	35·2	68/183	37·1	153/445	34·4
,, ,, under 65	73/160	45·6	24/53	45·3	49/107	45·8
,, ,, 45–65	62/116	53·4	21/43	48·8	41/73	56·2
,, ,, under 45	11/44	25·0	3/10	30·0	8/34	23·4

It will be noticed that the average age of the patients is very high, and that only about 20 per cent. are under 65. Perhaps the most interesting superficial observation is the high incidence of cases of psychiatric interest among the younger classes of patient. In the 45–65 years' group more than 50 per cent. show mental symptoms—a much higher proportion than among the aged, though the numbers involved are relatively small. Moreover, in many cases ascribed to the older groups the patient had been in hospital for several years

and in some the disease might be regarded as attributable to the earlier period.

2. *Age-group "under 45."*

Total chronic sick	44	(males 10,	females 34).
Psychiatric disease or complication	11	(,, 3,	,, 8).
Mental defectives	5	(,, 2,	,, 3).
Presenile dementia	5		
by disseminated sclerosis	3	(,, 2,	,, 1).
by epilepsy	2	(,, 1,	,, 1).
Hysteria	1	(,, —,	,, 1).

Five patients were congenital mental defectives with gross physical incapacity and might have been found in any institution for defectives.

From a total of 7 cases of disseminated sclerosis, 2 cases showed obvious symptoms of organic brain involvement to the extent that they were unable to converse properly or take part in any communal entertainments or functions, and another showed a marked depressive apathetic reaction.

There were two epileptics in whom dementia had progressed to an obvious stage and a youth who suffered from very extensive poliomyelitis had hysterical spasms.

3. *Age-group* 45–60.

Total chronic sick	116	(males 43,	females 73).
Psychiatric disease or complication	62	(,, 21,	,, 41).
Presenile dementia	36	(,, 11,	,, 25).
Primary	5	(,, 3,	,, 2).
Secondary	31		
By arteriosclerosis	21	(,, 6.	,, 15).
,, disseminated sclerosis	2	(,, 1,	,, 1).
,, bulbar palsy	1	(,, —,	,, 1).
,, cerebral tumour	1	(,, —,	,, 1).
,, epilepsy	5	(,, 1,	,, 4).
,, myxoedema	1	(,, —,	,, 1).
Taboparesis	4	(,, 4,	,, —).
Hysteria	1	(,, —,	,, 1).
Mental defectives	20	(,, 9,	,, 11).
Paraphrenia	1	(,, —,	,, 1).

The incidence of mental disorder in this group of the chronic-sick was very high (53 per cent.), though it was raised artificially by the presence of 10 patients whose disease was primarily mental and required no physical nursing. These were 5 cases of primary presenile dementia, a paraphrenic who was subsequently transferred to a mental hospital and 4 mental defectives who were able to be up all day.

4. *Age-group 65 and over.*

Total chronic sick	628 (males 183, females 445).
Psychiatric disease or complication	221 (,, 68, ,, 153).

This group of chronic-sick comprised 79·7 per cent. of all the patients. Almost 30 per cent. of them were over 80.

The differentiation between senescent deterioration and senile dementia is a matter of individual judgment. Howell (1945) has made use of the term "normal senile mentality," which presumably is intended to indicate a certain degree of forgetfulness, emotional restriction and narrowing of interest, though some aged people are found in whom it is not possible to detect changes of this kind. From the point of view of "personality," however, such findings are disorders. They indicate a pathological change in the function of the mind, even though it may be argued that its basis is physiological and inevitable. Patients showing these symptoms might reasonably have been called "simple senile deterioration" and added to the total of mental disorders, but for the purposes of this investigation when only these traits were present, they were recorded under "forgetfulness" as a separate category. There were 86 patients (37 males and 49 females) in this group. Only those who gave the impression of a definite organic type of reaction were included under the term "senile dementia." The statistics for this age-group were:

Senile dementia	167 (males 44, females 123).
Including arteriosclerotic symptom types	55 (,, 16, ,, 39).
Paranoid states	22 (,, 10, ,, 12).
Depression	18 (,, 3, ,, 15).
Senile hypochrondriacal obsessions	4 (,, 3, ,, 1).
Anxiety states	6 (,, —, ,, 6).
Hysteria	1 (,, 1, ,, —).
Mental deficiency	3 (,, 1, ,, 2).

These patients had been admitted owing to physical dysfunction associated with cardiovascular degeneration, cardiac failure, hemiplegia, senile Parkinsonism, bronchitis, arthritis, fractured femur and other disorders of the senile period.

B. *Clinical Types.*

1. *Organic reaction types.*—80 per cent. of the psychiatric cases had an obvious organic element in the aetiology of their disorder. As there is a natural tendency to assume that senile dementia covers the complete scene in a population of this type, Table II is inserted to demonstrate the statistical relationship between this disorder and the other groups.

TABLE II.

	Number.	Total. Per cent.	Male. Number.	Male. Per cent.	Female Number.	Female Per cent.
Total senile dementia	167	—	44	—	123	—
Of all patients	167/788	21·2	44/236	18·8	123/552	22·3
,, mentally disordered	167/294	56·8	44/92	47·8	123/202	60·9
,, organic dementias	167/232	71·6	44/65	67·6	123/167	77·2

The type of senile dementia chiefly encountered differed from that generally admitted to mental hospital. The quiet, apathetic, disinterested, disorientated and incontinent types resembled more the terminal states of G.P.I. than presbyophrenic states. These apathetic states comprised the great majority of the cases, but restless ones also occur and are nursed in cot beds. The clinical types associated by Howell (1945) with progressive cerebral ischaemia appeared to occur frequently. After a period of varying length in which forgetfulness and the minor traits of simple senile deterioration are obvious, the patient enters a hyperactive episode with confusion and restlessness by day and night. This is soon followed by stuporose and then comatose states. The whole sequence may cover a period of two or three months and it is suggested that the stages represent cerebral, thalamic and medullary ischaemia. It may be that this disease sequence is seen more completely in the chronic-sick wards than in mental hospitals, where admission is delayed until the second stage. Howell does not regard all restless patients as included in this pathological classification, but asserts that the syndrome is a terminal one and should be recognized as such. The high death-rate occurring among patients admitted to institutions because of senile restlessness is a constant finding. Even taking into consideration the exhaustive factor, the weakness attributable to age and the liability to broncho-pneumonia, it seems reasonable to regard these states as a signal of a failing circulation rather than as having origin in the brain only. Rothschild's work (1942) on the relationship between heart size and the effect of cerebral lesions tends to confirm this. He found that patients who had had milder cerebral symptoms had post-mortem evidence of cardiac enlargement which appeared to have offered some " compensation" to the cerebral circulation.

Functional elements may complicate cases of apparent senile dementia. Sometimes it seems that the apparent loss of memory and disorientation may be at least partly due to inattention and hopelessness, and to the effects of poor perception by partial blindness or deafness. A withdrawal of interest may also occur in response to the popular attitude that old people should not interfere with the interests of others. Some families may hasten the onset of maladjustment in their parents by the habit of withholding information from them. Admission to hospital is, in some quarters, used as a threat towards the aged, who, in the opinion of their families, tend to interfere and it is not surprising that on admission to hospital they believe that they have been " put away " and react to this in the way they feel appropriate. To be ill and require hospital attention is regarded by some as in itself a severe blow to self-esteem and such readily develop abnormal responses which modify their symptoms and, it is possible, accelerate the senile deterioration.

The chief presenile organic reactions also differed from the usual mental hospital types in their quiet uninterrupted apathy. Primary presenile dementias were not typical of the Alzheimer or Pick's types, though further physical and sociological investigation would have been required for accurate diagnosis. Secondary presenile dementias had usually gross physical incapacities and ample evidence of the physical factors in aetiology. Among the true chronic-sick in the physical sense the psychiatric complication most frequently met was a secondary presenile dementia following high blood-pressure and

hemiplegia. These patients showed emotional lability and inability to concentrate which appeared to lead to disorientation for time and progressive apathy. A high proportion of those suffering from tabes or taboparesis were predominantly apathetic and disorientated, though one had marked paranoid ideas without dementia. Other secondary presenile dementias occurred in association with disseminated sclerosis and bulbar palsy, cerebral tumour, epilepsy and myxoedema.

2. *Depressive reaction types.* (18 cases).

Involutional melancholia . . .	2 (males —, females 2).
Depression with organic reaction . .	8 (,, 4, ,, 4).
Reactive depression, pathological . .	8 (,, 3, ,, 5).
,, ,, not pathological .	Not enumerated.

There were two cases of involutional melancholia, one of whom had an old hemiplegia. The other had previously been in a mental hospital and was re-transferred with a view to treatment.

Other cases in which depression was the most outstanding symptom occurred with organic senile states with marked physical symptoms, but the majority could be classed as reactive depressive states. For statistical purposes only those which were judged to be beyond reasonable bounds in degree or duration were accepted. Such mental conditions were accompanied by self-centredness, pessimism, apathy, anorexia, fatigue, insomnia and visceral disturbances and preoccupation with the effects of the concomitant disease or the distressing aspects of the hospital life.

There was a high incidence of reactive depressions of a type which could not be regarded as psychotic, nor even neurotic, but were the response to being both old and sick at the one time. In this state the outlook may appear hopeless and effort futile. Such states are often based on false assumptions and may be relieved with a little medical explanation, guidance and encouragement. This is obviously so much due to the patient that one hesitates to call it psychotherapy.

Suicidal attempts are not frequent in these wards, where physical handicaps are usually severe, but such incidents have occurred in the hospital history of a few of the patients examined. It seems extremely important that diversional occupational therapy, books, radio and other stimulating activities should be provided to a maximum for these patients and that visitors and voluntary workers should be encouraged to come and increase the quota of interest in the environment. Further therapy is usually excluded by the physical state, though, alternatively, an improvement in this sphere may contribute materially to the relief of mental symptoms.

3. *Paranoid reaction types.* (23 cases).

Paraphrenia (physically well) . . .	1 (males —, females 1).
Paranoid states with organic reaction .	14 (,, 3, ,, 11).
,, ,, without organic reaction	8 ,, 4, ,, 4).
,, ,, with associated deafness	7 (,, 3, ,, 4).

These were generally found among the old people and were philosophically accepted by the nursing staff (who had no mental training) as merely an example of the way people became " queer " in later life. In some cases hallucinations were present and the patient would see " lights " or " figures " or reply to " voices " quite obviously. The more common situation, however, was one in which the patient was reserved and quietly suspicious of the staff and other patients, and periodically expressed offended pride or made unjustified accusations.

Partial or severe deafness was a frequent accompaniment of these conditions. Such handicaps reduce the capacity to communicate with others and readily give rise to misunderstandings, which are initially genuine, but if not corrected, may result in unnecessary hostility. The result is that the patient is prepared to believe the worst of his attendants and elaborates their misdeeds as a function of his resentment. Perhaps jealousy of youth and vigour may contribute to the disorder in certain personalities, especially if insufficient sympathy and attention is accorded to reminiscences or other compensatory mechanisms.

4. *Neuroses.* (13 cases).

Hysteria	3	(males 2,	females 6).
Anxiety states	6	(,, —,	,, 6).
Senile hypochondriacal obsessions	4	(,, 3,	,, 1).

One case of painless facial tic occurred in a patient suffering from chronic bronchitis. Another younger patient had hysterical movements of the limbs. These occurred on commencing to converse with a stranger, but were less obvious once acquaintance was established. The habit had been present for many years and the patient was a helpless cripple from anterior poliomyelitis.

A case of paraplegia, aged 50, was admitted at the urgent request of the Relieving Officer, as some of the neighbours, by whom she had been looked after for some months, had reported the unsatisfactory circumstances. As the history of previous attacks was given along with a diagnosis of disseminated sclerosis the usual screening at the acute hospital was not carried out. Personal history and a thorough physical examination, however, cast doubt on the diagnosis, and adequate power was found on examination of the legs. Light hypnosis and persuasion over some weeks effected a symptomatic cure. The patient was in " reduced circumstances " and greatly resented having had to go out to work in later life after a youth of ease. Following a motor accident she had frequent illnesses during which her friends treated her with special favour without requiring her to accept money. She was not entirely without insight into the nature of her afflictions.

Chronic anxiety states were met in association with high blood-pressure and heart disease. The somatic component in the aetiology appeared to be so predominant that sedatives seemed justified as the therapeutic measure though two cases responded to psychotherapy to some extent.

Hypochondriacal obsessive states were not uncommon. Some were associated with depression, others with anxiety and some seemed to have a " conversion " basis. Fear of recovering to the extent of having to leave the

hospital is not unknown among those old and infirm people whose discharge from hospital would mean renewal of a lonely struggle against cold and hunger. A well-meaning enquiry for symptoms in these cases meets with a ready response, though one does not readily diagnose malingering among creaking joints and atrophic muscles. When it is made clear that recovery may lead to a hostel with certain attractive features, however, a change of attitude is sometimes seen and the advantages and privileges of illness given up. Hypochondriasis in an old person may be based on a true physical dysfunction due to the atrophy of glandular and muscular tissue, which may be regarded as physiological in senescence. Changes in diet or eating habits or other modifications of routine may help to relieve this physical component of the condition, while on the psychological side a recovery of other interests may be helpful. In many cases, however, the Freudian explanation of the regression to " pregenital interests " will be invoked.

5. *Congenital Mental Defectives* (28 cases).

Imbeciles and high- and low-grade feebleminded types were found. Many of these cases are helpless invalids from diplegic or paraplegic disabilities, but others had been admitted with some transient or long-term illness after which their relatives had found it impossible to welcome them home. Of the latter, the high-grade types often help with some ward work and many have been in hospital for years, as they were admitted before admission to colonies with a view to training was regarded as important. One outstanding case of this type was a relatively high-grade young woman who suffered from recurrent intestinal obstruction due to Krohn's disease. She was an unstable person with recurrent depressions, but had been able to do a fair amount of domestic work. Eventually, in a depressed and suicidal state, she had to be admitted to mental hospital, where she died in a recurrence of the physical trouble. It was felt that she had missed the benefits provided by the Mental Deficiency Services, which might have increased her stability and confidence.

The Significance of the Findings.

It is impossible to consider the results of this inquiry, taken in conjunction with the reports of the Nuffield Surveyors, without criticizing the arrangement for the chronic-sick, in which it is possible to find a greater mixture of mental disorder than in a well-arranged mental hospital. It is clear that the present authorities responsible for these cases are blinded by the impression that a majority of the cases suffer from uncomplicated physical changes—and have failed to realize that psychiatric problems exist in these wards. Psychiatric specialist help is of definite value among these cases. They are looked after for the most part by nursing and medical staff who have little knowledge or interest in this type of disorder—not due to lack of personal qualities, but to the fact that few nurses or doctors are trained either among chronic-sick or psychiatric cases. The result is that violent or persistently annoying behaviour disorders are required before action based on psychiatric thought is taken and quiet patients are nursed with a view only to their physical needs. Admit-

tedly the effect on most cases is not adverse, but when large numbers of chronic-sick are considered it is not difficult to discover cases in which advice on the mental state would have been of benefit or who should be nursed by mental-trained staff. At this time, when Regional planning seems likely to assist in breaking down the barrier between mental and physical ailments, it is important that the full needs of this class of patient should be taken into consideration

From the aspect of information and statistics it is obvious that in the hospitals for the chronic-sick throughout the country there exist large numbers of mentally-ill people outwith the purview of the Board of Control, whose reports are regarded as covering the field of psychiatric in-patient treatment in this country. The numbers in these hospitals must be much larger than any other group of uncounted mentally-disordered people. It seems reasonable to conclude that these people, to a large extent, account for the difference between British and American statistics relating to admissions to mental hospitals among the higher age-groups, to which reference has been made.

Management of the Chronic Sick with Special Reference to Psychiatric Aspects.

Types of Hospital.

Among the chronic-sick there is a variable, though relatively small percentage of younger people under 45 (12 per cent. in Leeds) suffering from such conditions as post-encephalitic states, disseminated sclerosis and other disorders of the C.N.S., chronic heart failure, rheumatoid arthritis, etc. Such cases are also found in the various privately-managed homes for cripples and incurables throughout the country. It is desirable that the younger age-groups should be removed from the ranks of the remainder of the chronic-sick. They should be provided with special long-term accommodation, including occupational activities, entertainment and diversional facilities, according to their needs and capacities.

It is to be expected that the term chronic-sick implies chronic-sick physical cases. Although the vast majority of the mental disorders among the chronic-sick are organic in basis, senile dementia is by no means the only form of mental illness which occurs. Thus, whether desirable or not, hospitals already exist in which are collected the organic reaction and senile types of mental disorder though, unfortunately, they are mixed among normal people. One of the first steps taken when an attempt is made to improve the conditions of the chronic-sick is the segregation of the psychiatric cases. The fear that nursing morale will fall, prevents most large authorities from following the lead of the London County Council in creating a special hospital for this type of case only. Such fears are not entirely unjustified. It would appear that before such an establishment can be successful, it is necessary that from the medical point of view the poverty in response from the patients should be offset by research activities and, from the nursing angle, that the institution must be sufficiently large to ensure that the admission- and discharge-rate is big enough to provide interest. These difficulties could also be overcome if, as suggested by Cunningham Dax and Reitman (1946), hospitals were estab-

lished specializing in psychiatric treatment of the aged into which all types of behaviour disorders could be admitted. Among these, convulsive and other special therapies might be indicated. From the point of view of the chronic-sick, however, admission would have to be based more on clinical and social grounds than on a definite age-limit, as it has been demonstrated that a fairly large number of beds are occupied by cases of dementia occurring between 50 and 60 years.

It seems more desirable, however, that the older age-groups should be admitted to hospitals for the aged in which subdivision into medical and psychiatric types would be obvious and natural, and acute medical and surgical conditions could also be catered for. Such a service (which is analogous to the paediatric special hospitals) could be completed with out-patient facilities and social services. The geriatric hospital, it is therefore suggested, would provide the best solution to the problem of accommodating the chronic aged sick, and in it a certain proportion of mentally disordered patients would be expected.

It is desirable that the buildings provided for such a hospital should be adequately subdivided so that not only different medical, mental or surgical categories may be nursed separately, but some attention may be paid to the requirements of the patient's personality. The individual tends to be lost in large wards and to be tormented in small ones if the company is uncongenial. The aged have difficulties in acquiring new adaptations to changes in their surroundings and require as much individual attention as possible. Wards of 4 and 8 beds are the most acceptable size and their equipment should include adequate bedside lockers, screening arrangements and bed lighting. Special provision should be made for patients who are able to be up for part of the day. They require homely day rooms, hand rails and other aids to walking or wheel chairs. Verandahs or balconies are very desirable.

Medical Arrangements.

The geriatric hospital envisaged above would differ from the present chronic-sick type in that it would be attended by medical men of consultant rank, who would attend the acute and chronic wards. The success or failure of the therapeutic and research activities of the institutions would then depend on the interest or zeal of these individuals, but the classification of types of patient accomplished would in itself be a great help to the organization of investigations and the collection of statistics. The prospect of success in advancing knowledge of geriatric disorders would be infintely greater than now, when the chronic-sick wards, which are the equivalent at present, often have no specialist advice unless on rare occasions.

The chief clinicians attached to the hospital would be the physician, psychiatrist, surgeon, orthopaedist and ophthalmologist. The physician and psychiatrist would be responsible for the majority of the beds, but would frequently be required in all departments. The growing importance of the disorders of old age are well enough realized to make it possible to fill the resident post by medical men of " registrar " status interested in the research aspects

of the work, and by others who realize that work among the aged constitutes a very large part of general practice.

Functions of the Psychiatrist.

(a) *Among the Chronic Sick.*

It cannot be reasonably expected that the relatively small number of psychiatrists at present available should be expected to devote much routine time to the chronic-sick. The increase in the amount of teaching on psychological aspects of medicine in the medical curriculum, however, should increase the impulse among those responsible for the management of these cases to classify them and insist on the provision of the facilities required for the various types. There exist, for example, hospitals without day rooms for up-patients, diversional activities, entertainments or facilities for physiotherapy—the lack of all of which may be an important factor in the life of these long-term and not necessarily incurable cases. In the meantime psychiatric knowledge and advice should be made available to all hospitals dealing with the chronic-sick to advise both on general and specific aspects of the cases. Such a service would improve the morale of the patients and act as a prophylactic in reducing the incidence of apathy and depression which is encountered, and would possibly result over the country in the investigation and treatment of many individuals.

(b) *In a Geriatric Hospital.*

The Psychiatric Unit in this type of hospital would often encompass a larger number of beds than any other single department. It could be run as an extra-mural activity of the local mental hospital by the seconding of junior medical staff for periods of months, and the extension of the senior staff consultant duties. Perhaps the most valuable aspect of the arrangement would be the facilities which would be created for the interchange of patients whereby it would be possible to arrange for those no longer requiring the full legal and nursing facilities of the mental hospital to be readily found accommodation outside. If the buildings and grounds were specially planned and the appropriate staff employed, it would be possible to provide all the facilities for senile psychoses, but this would not necessarily be the policy adopted.

It has been demonstrated that such wards already exist, at least in nucleus, though they are camouflaged by their name and prevented from functioning by lack of the special staffing arrangements. It should be possible for the Regional Hospital Boards to reorganize its facilities along such lines to the great advantage of its patients, and at the same time to make avenues of research into geriatric conditions more obvious.

Nursing Arrangements.

There is probably less glamour and more distasteful duty attached to the nursing of chronic organic dementia cases than in any other branch of nursing. Only the exceptional hospital catering for this type of case has, at present, adequate nursing staff. It is in chronic-sick work that the part-time nurse has been found to be invaluable ; indeed it is only in this sphere that part-time

nursing may be said to be wholly advantageous both to the patient—who welcomes any environmental change—and to the nurse who is relieved of monotony and the repetition of much unpleasant work. There must be a basis of trained staff (1 to 40 patients is the minimum), while the greater part of the nursing is carried out by the part-trained assistant nurses. The more knowledge of the aetiology of the symptoms shown by their patients, possessed by these assistant nurses, the more interest will they find in their work. It is therefore important that psychological material should be incorporated in the instruction given to pupil assistant nurses. The employment of ward orderlies in these wards is desirable and their duties may be more extensive than in acute hospitals—for example, the feeding of the helpless patients, which is a major item in the routine ward work, may, where the swallowing reflex is normal, be undertaken by sympathetic though unskilled workers.

The high proportion of truly psychiatric cases among the chronic-sick and the difficulty in obtaining nursing staff appears to be an argument for an instruction that, where these cases can be segregated, the nurses attending them should be paid at the mental nurses' scales, which are higher than the General Rushcliffe scale. Such an arrangement would be a little encouragement and reward to the apparently forgotten race of chronic sick nurses.

Summary.

A survey of the psychiatric disorders occurring in cases admitted to hospitals for the chronic-sick demonstrates that 37·3 per cent. of these cases—for administrative purposes regarded as of physical disease—suffer from concomitant or uncomplicated mental illnesses. Details are presented of the psychiatric states found in the survey. These include nearly all the common reaction types. The statistics confirm Lewis's explanation of the difference between British and American methods of estimating and dealing with the numbers of psychoses occurring in the higher age-groups. The clinical features described disclose a field in which specialist advice should be available, but has in the past been rarely utilized. Some suggestions are made for the reorganization of the services under review.

I have to thank Prof. J. Johnstone Jervis, Medical Officer of Health, and Dr. Wm. Mackintosh, Medical Director of Hospitals, City of Leeds, for permission to communicate these observations.

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THE SYNDROME OF VISUAL ALEXIA WITH COLOUR AGNOSIA.

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Cases showing alexia which is not part of a general visual agnosia or of a speech disorder (letter or word blindness, cécité verbale pure) are uncommon and deserve careful study for a variety of reasons. The conception of word blindness as loss of visual memories due to a localized cerebral lesion (Hinshelwood, 1917) has been challenged by later investigators who aimed at a more general analysis of impairment of cerebral functions. The application of the principles of Gestalt psychology has introduced new aspects into the study of word blindness. Investigations into acquired word blindness, apart from their psychological and neuro-pathological interest, are of value for the understanding of congenital word blindness which has been found to be a condition of considerable practical importance. It was the investigation of cases of acquired word blindness which led Hinshelwood to the first full description of the congenital disability.

Word blindness is, as a rule, associated with a disability termed "colour agnosia." The nature of that symptom and its relationship to visual agnosia on the one hand, and to aphasia on the other, have been the subject of controversy over many years. At first it was regarded as an aphasic symptom, later as a form of agnosia. More recently it has again been understood to be caused by the impairment of the same basic function which underlies amnesic aphasia.

The following two cases might contribute to the elucidation of some of the problems outlined above. The first case was under observation for ten months, while in the second case the syndrome was present for two weeks only.

Case 1.—Mr. J. A—, aged 63, retired engineer, was admitted as a voluntary patient on 23.iii.46. His wife gave the following history:

The patient had been healthy physically and mentally until twenty months prior to his admission. He was of a cheerful disposition and was regarded as a man of good intelligence. He had left school at the age of 14 and had no special training in mathematics. His main interests, apart from his work, were sports and politics. He used to take two daily papers and read them thoroughly. He also read engineering books. He had no difficulty in distinguishing colours before his illness. He used to be an excellent writer. In June, 1944, he complained of a sudden feeling of giddiness. There was no loss of consciousness; his right arm was weak and numb for a few days. Since that attack he had been unable to read. His memory was bad for some months after the attack, but improved gradually. Apart from an occasional difficulty in remembering names, his speech was unimpaired. During the year preceding his admission he had become very irritable

and suspicious. He accused his wife of being unfaithful to him and trying to rob him. He complained about insomnia and irritability.

On admission the patient did not show any conspicuous mood or behaviour disorder. When asked why he had come to hospital he referred to the attack in June, 1944, and to his insomnia. Throughout his stay in hospital he never mentioned his suspicions and when questioned either denied or refused to discuss them. His behaviour while under observation was entirely normal.

Physical examination.—The patient was in good general health. His heart was slightly enlarged to the left and the second aortic sound was accentuated. B.P. 170/105. The peripheral arteries were rigid and tortuous, and the fundi showed signs of arteriosclerosis.

Nervous system.—There was a right-sided homonymous hemianopia with intact perimacular fields. The left visual fields were normal for white and colours (green, blue and red were tested). Visual acuity $\frac{6}{6}$ with correction. Those findings were verified by the consultant ophthalmic surgeon, Dr. Fraser. There was no disturbance of gazing. No disturbance of sensation. Stereognosia intact. Serological and cytological examination of the blood were negative. Urine negative.

Throughout the period of observation, which extended over more than ten months, the patient was most co-operative and submitted willingly to testing for any length of time. He regarded the various tests as methods of rehabilitation. It was always easy to attract his attention and he never spontaneously complained of getting tired, although his performance deteriorated when an examination extended over more than half an hour.

The patient was correctly orientated for person, space and time. His general knowledge and knowledge of current events were fair. He sometimes failed when asked the names of leading political personalities, but he could tell their ranks and the parties they belonged to, as well as their most conspicuous personality features. When their names were offered to him among others he picked them out correctly. Recall was moderately impaired. When tested he often failed to remember correctly a date and an address after more than five minutes, but he would remember the nature of the item he was supposed to recall, even after several hours. He always knew the date correctly and he was always able to state when he was admitted and how long he had been in hospital. The use of numbers was unimpaired. He could carry out multiplication, such as 27×12, without difficulty.

When asked to enumerate objects belonging to a certain category, such as capital cities, flowers, tools, furniture, birds, he usually succeeded, with some effort, in naming six to ten examples. His comments showed that in carrying out those tests he imagined a concrete situation, such as a map when enumerating the capital cities, a garden when naming flowers, a workshop when naming tools, etc. He had no difficulty in ordering objects according to certain qualities, such as material, shape, size, etc.

Orientation on his own body and on other persons' bodies was correct. No finger agnosia. Right-left orientation unimpaired.

In the Mill Hill Vocabulary Test he scored Grade 3 (average intelligence) in both definitions and synonyms. He obtained the same grade in Raven's Progressive Matrices. These results showed that neither his vocabulary nor his intelligence could have suffered severely and that his spatial orientation was unimpaired.

Speech.—The patient spoke fluently and with good articulation. In conversation his speech appeared entirely unimpaired and there was no noticeable poverty of nouns. His understanding of spoken language was perfect. Naming of objects, was, as a rule, correct. Only on rare occasions, especially when he was tired, he had difficulty in naming an object, e.g. in a series of tests he successively named handkerchief, wallet, ring and keys, pin, watch, neck-tie, matches, knife, inkwell, cigarette case, torch, radiator, comb, stamps, banknote correctly, but failed to name a desk-lamp (" they use it in offices, an electric.....''). His ability to name colours was greatly impaired (see below).

Writing.—The patient was able to write letters and words dictated to him correctly and without difficulty. Writing of figures of any size and of decimals was unimpaired. Spelling was, as a rule, correct. However, when called to write long words he would sometimes repeat or leave out a letter or a syllable. He made similar mistakes in writing sentences, and he had a tendency to repeat letters,

syllables and sometimes words for which his inability to read what he had written was obviously responsible. He used to write long letters home daily, describing his experiences in hospital. His letters showed a complete lack of punctuation, except for an occasional dash. He wrote capitals only at the beginning of his letters, which were not divided into paragraphs, and at the beginning of names of persons and animals. Apart from repetitions and occasional omissions the grammar was correct. The following lines taken from one of his letters shows the type of mistakes he made :

> " Dear Flo—
>
> " Just a few lines hoping you are keeping well trusting you are keeping well I am picking up very an improving and before long will be quite well again and Gill how is she getting on wait till I see her she is a good dog though she has a few dirty or should I say rude habits anyway look after her the weather here has been its old self again."

Copying of single letters, short words and numerals was correct. In copying long words he seemed to lose the thread easily and attempted in vain to read what he had written. The same applied to the copying of sentences. Short sentences consisting of words with one or two syllables were, as a rule, copied correctly. It was obvious that he wrote copying letter by letter and he often spelled aloud when copying. Although he would read most letters individually without difficulty he tended to copy " slavishly," e.g. he used to imitate unusual forms of the " s " written by the examiner and when copying a word written in capital letters or letters separated by a certain space he always followed the presented pattern meticulously.

Constructional ability was undisturbed. He could copy and, at request, lay without model patterns of matches, blocks or mosaics. His performance in the Kohs test was normal. He could draw geometrical figures and objects, such as a house, table, bird, hand, hammer with and without pattern. The perspective was correct and the professional touch was unmistakable.

Visual functions.—The patient was not aware of his hemianopia, although he sometimes knocked into objects which were in his right visual field. He was conscious of his alexia. He did not spontaneously refer to his disability of naming colours, but appreciated it when tested. When asked whether, apart from his alexia, there was anything wrong with his vision he used to complain about it being not clear, or blurred, or blotchy, and tended to blame this for his reading difficulties. He stated that for about a week following the sudden onset of his illness print, but not other objects, had appeared upside down. That symptom has passed completely and he did not remember that there had ever been a period when he saw letters sloping. Stationary or moving objects were recognized correctly. He enjoyed attending the cinema and could follow the film without difficulty. He never failed to describe and recognize pictures of objects and scenes correctly. He was able to pick out on request one of a large number of objects or pictures of objects spread before him. He also could recognize and name geometrical patterns. When shown a drawing of a face with a part missing he could fill it in. His visual imagery was unimpaired, but only as far as the shape of objects was concerned. His colour was imagery impaired (see below). There was no disturbance of spatial orientation. He found his way about the ward and in the hospital grounds without difficulty. He judged distances well and localized the position of objects in space correctly. The appreciation of perspective was unimpaired. The estimation of absolute and relative length and size was normal. He could connect two dots with a straight line and halve that line accurately, provided its right extremity did not fall into his right visual field. His topographical memory was good and he could draw a sketch of the ward with the correct position of his bed. He could read the time from a watch and he could set the hands of a watch to a given time.

Reading.—Single letters were, with some exceptions, recognized correctly. He often failed in recognizing letters of an angular shape, such as " K " (which he often read as " X "), or " N " or " X " (read as " K " or " I "), or " F " (often mistaken for " I "). Less frequently he mistook letters of circular shape for similar ones, such as " D " for " O," " P " for " Q," " Q " for " G," etc. Often the mistakes were of the mirror type, e.g. " b " was read as " d" and vice versa.

Drawing of cross hatching marks across the letters did not noticeably interfere with his performance. There was no indication that in reading he availed himself of other than visual aids, such as " writing movements " with his hands or head. If letters were put before him in wrong position in space he could read them as well as those presented in the correct position. The shorter the time of exposition, the more frequent were the mistakes, but he did not show any type of mistake on short exposition which did not appear otherwise.

Tachystoscopic examinations were carried out together with Dr. Pickford at the Psychological Department of Glasgow University. Single letters were exposed for one-fifth and one-tenth of a second. When coloured letters were exposed the performance did not suffer noticeably. However, when the patient was requested to read the letter and also to note the colour he made many more mistakes, and several times he failed to identify either when the time of exposure was below half a second.

When requested to pick out certain letters from a set of block letters or from a printed word he succeeded as a rule very well. Foreign letters, e.g. Greek, were recognized as such. In trying to identify wooden block letters stereognostically he made similar mistakes, as in reading visually.

When letters were written on his skin with his eyes closed he usually recognized the circular and bent shaped, such as B, R, S, D, O ; sometimes he mistook them for similar ones, e.g. G for O, C for J, J for P. He could identify the simple angular letters L, T, V, drawn on his skin, but he failed with the more complicated ones, such as F, M, H.

Punctuation marks were not recognized at all, irrespective of whether they were presented within the context of sentences or isolated. He described them correctly as dots or geometrical figures, but they had no symbolic meaning for him.

Reading of words.—The patient could read words only with the help of spelling. Having spelled the word aloud or to himself he would say it correctly. Only very short and common words consisting of not more than three letters he would occasionally read without spelling. In spelling longer or unusual words he lost the thread easily and he often gave up after the second or third letter. When trying to read a long word he would drop letters or read them incorrectly, even if they did not belong to the types of letters which he found it difficult to identify singly. When his attention was drawn to a mistake he sometimes rectified it.

Extracts from examination records :

" Evening " (handwritten) : " e, v, e, n, i, n, g—evening."

" Robert " (handwritten) : " r, o, m, e, r, t." When the " m " was questioned he said, " It's a ' b ' I think."

" Horse " : " h, o, r, s, e—horse."

" Tempest " (print) : " t, e, m, n, e, s."

Tomato, sand, table, air, soil were spelled and read correctly.

" Chestnut " (print) : " You see n, u, t at the end. The first letter seems to bother me. I should know it ; I have seen it. Is it not a ' w ' ? I might be a ' c '." He now spelt and read the word correctly.

He often declared spontaneously that he had mis-read a letter, but was not always able to choose the correct letter when it was said among others, e.g. " Hips " (print) : " That's not ' n ' ? (Points to the first letter.) " n, i, p, but I think I got the first letter wrong." He did not pick the " H " when it was offered among other letters.

Sometimes he would grasp the approximate meaning of the word, or name the category to which it belonged, but he was unable to read it ; for instance, " elderberries " : " Something belonging to fruit, but I cannot put it together."

In attempting to read short sentences he failed in the same way as he did in reading words, but he made spelling mistakes in reading short words which he would spell correctly when they were presented alone. For instance, when the sentence " It is rather cool to-night " was presented he read " It is r, a, t, p, e, r, c, o, a, t t, o, b, i."

When incorrectly spelt words which were not too long were presented he was, as a rule, able to rectify the mistake, e.g. in " Hause " he replaced the " a " by " o " ; in windowe he struck out the " e."

When a letter or two were left out in the word he often succeeded in filling in

the missing letters when told their number, e.g. " s–n" he completed to " sin " ; " h—se " to " house " ; " Mo–day " to " Monday," etc.

Reading of Arabic figures including decimals was unimpaired. He could read numbers such as 45,360,471 correctly without hesitation. He was quite unable to read Roman figures beyond IV. It was obvious from his mistakes that he set about reading them in the same way as Arabic figures, e.g. XXVII " Ten thousand, ten hundred and fifty-three."

Musical notes had always been unknown to him.

Colour Vision and Recognition of Colours.

The patient very frequently failed in naming colours correctly, irrespective of the setting in which they were presented. This disability became more obvious when he was tired and when he had to describe multi-coloured objects or pictures. He was not colour-blind. He could distinguish yellow and blue, and green and red, but he frequently failed to name them correctly. In the Ishihara Test his responses were those of a subject with normal colour vision although he often failed in naming the colours of the dots constituting the numerals and the background ; e.g. in Plate 1 he read the number " 12 " consisting of bright red dots on a background of blue dots correctly, but he described the red dots as yellow and the blue ones as green. In Plate 2 he named the dark and bright green of the background correctly, but he described the various shades of red and yellow constituting the figure 8 as " pinkish." Sometimes the colour of the background seemed to influence the naming of the dots constituting the numerals. The absence of colour-blindness was confirmed by Dr. Pickford, who repeated the Ishihara Test and also carried out colorimetric examinations and the Holmgren Wool Test.

In naming colours he failed with some more often than with others, but there was none which he would invariably name correctly. He could always distinguish shades of brightness and never failed in recognizing the identity of colours in different objects. His performance varied a great deal. In the same series of tests he would give the right name of a colour, and five minutes later make gross mistakes when it was presented again. Even when he chose the correct name he very often was uncertain and frequently qualified his description by the suffix " ish." White was described as " cream " or as " whitish," black as a rule as " blackish " and sometimes as " dark blue." Sometimes, when he mis-named a colour, certain features of the colour presented such as brightness, appeared in the wrong name. For instance, a bright green was called " pinkish." When told that he had mis-named a colour he would, as a rule, admit this, but only rarely was he able to rectify his mistake, occasionally he insisted on his description and admitted his error only when the colour, the name of which he had chosen by mistake, was immediately presented to him.

The patient frequently characterized a colour by relating it to an object, the colour of which was familiar to him. Brown or red objects were often called " stone coloured," grey objects " slate-coloured," etc. On other occasions the correct name was enforced by reference to concrete objects.

Extracts from examination records :

Brown wallet : " Brownish as far as I can see."

Blue stamp : " Blue."

Black button : " Not quite black, but it is near it."

Maroon-coloured wallet : " Reddish. It might be green." A week later he said, when shown the same article, " It is green, it might be blue." (Is this the colour of grass ?). " There's a difference in shade, but if you take the average I would say yes." (This is red.) " No." Now a green square was shown to him and he named the colour correctly. When the wallet was presented again immediately afterwards he said " You are right. It flashed on me as green."

Red tie : " I can't remember. It doesn't seem to be red."

Blue ink : " Blue or green."

Buff coloured case book cover with dark red back and green string : He describes the buff as " yellow," the dark red as " reddish " and was unable to find a name for the green.

When asked to name the colours of the carpet in the office he described orange as " stone-colour " and blue as " green." He was able to match the green of the examiner's socks with an identical colour on the carpet.

Coloured pictures :—

Baby in green tub : Correct.
Blue shoe : " Green."
Grey pail : " A slatish colour."
Orange-red pail : " Salmon colour."
Red pail with blue and white stripes : The red is named correctly, the blue as " green," the white as " cream " and the black background as " blackish."
Green book-cover : " Greenish."
Orange book-cover : " That would baffle me."
Yellow book-cover : " This is a colour I am beat on."

On a picture post-card he described the pink correctly, the green as " blue," the yellow as " straw colour," the blue of the sea as " green." The blue of the sky was very frequently described as " green," but he usually rectified this when a real green was presented immediately afterwards. On other occasions he would describe green and blue correctly. The description of mixed and intermediate colours he found most difficult. Purple was described as " reddish, or on the brown side."

Coloured skeins :—

White : " Cream " or " whitish " or " whitish cream."
Light brown : " A biscuit colour."
Yellow : Correct.
Light green he calls " light blue."
Light blue : " A light blue." He now spontaneously calls the light green " a yellowish colour."
Dark green : " Black with bluish colour."
Red and black were, on that occasion, described correctly.

The patient made similar mistakes in naming coloured squares, or the surfaces of the Kohs Blocks. The size of the coloured surfaces made no marked difference to the quality of his performances.

When requested to point out certain colours in a multi-coloured object or picture he did this, as a rule, correctly, but often failed in differentiating green and blue. He made the same mistake in Holmgren's wool sorting test. He was aware of this difficulty. In the sorting test he was rather uncertain in separating red and brown. Even if he did not sort colours incorrectly he tended, in that test, to leave out those which were not very similar to the one which he had chosen first, or which had been handed to him. He chose according to likeness rather than to category of colour. He was able, however, to sort colours according to their brightness.

When requested to pick out coloured skeins to match the colours of an object named by the examiner, he succeeded as a rule, but not without considerable hesitation. In this test, too, differentiation between green and blue was the most difficult. Which colour is a pillar box ? " It would be a blue with a red—Post Office red." (Pt. picks a brown-red skein first, then a bright red.) Grass ? : Pt. picks light green. Sky ? : Picks dark green. Blood? : Correct. Tomato ? : He hesitates, points to purple, then to orange, adding that the latter was more likely to be correct.

The patient was requested to enumerate objects of certain colours named by the examiner. His performance was poor. He mentioned trees and grass as green objects ; Post Office red, danger lights, certain tram-cars, as the only representatives of red objects. He found it equally difficult to name objects to match colours shown to him.

Reactions to wrong colours.—The patient was shown drawings from a children's painting book in which some sketches were painted by the examiner in wrong colours. He invariably rejected a wrong colour and characterized it as unreal, although he was, as a rule, unable to name it correctly. Red frog : " This is not the right colour." What is the right colour ? : " It might be darkish brown." Green dog : " You never see them with that colour. It's blue, it's a toy colour." Black basket with purple fruit : " The basket might be right, but the colour of the fruit is too dark." He was shown drawings of three horses painted red, brown and green respectively. He pointed to the brown as the only correct one ; about the others he said " Kiddies might do it like that."

Colour imagery.—In describing colours of objects from memory the patient often failed. Not infrequently he appeared to describe a colour of the real object as it is seen in every day life rather than as it ought to be, e.g. when describing a goose as " greyish to whitish." On other occasions he failed absurdly. In his imagery, too, he showed a tendency to qualify his descriptions of colours. His imagery of forms of objects was intact.

Extract from examination record : Colour of blood—correct ; Grass—correct ; —aven—" I bit of grey in green " ; Swan—" different colours. Some are green, others whitish " ; Raspberry—" reddish " ; Frog—" blue-grey or brown " ; Goose—" greyish to whitish, according to age " ; Sunflower—" yellow, and white in the centre." Cigar—correct ; Roses—" red, blue, green or pink."

On the following day he described blood as " stone-coloured."

Progress notes.—The patient was discharged on 4.ix.46, but had to be re-admitted two months later owing to his paranoid behaviour at home. His condition did not change materially during the period of observation which had extended over ten months at the time of the conclusion of this article. However, certain changes in the relative degree of his symptoms took place. While the word blindness remained entirely unaltered, the colour agnosia showed a definite improvement. During the second half of the observation period mistakes in naming colours became less frequent and the patient did not use the qualifying suffix " ish " as often as previously. The most constant of his errors was still the confusion between green and blue. In recent months his colour imagery was noticeably improved, but he would still make characteristic mistakes occasionally, e.g. on 10.ii.46 he described from his memory the colour of a lion as " greyish " and that of a crow as " varying from black to grey," while the colours of ten other objects were named correctly in the same series of tests.

Case 2.—Mr. A. J—, aged 68, retired bank clerk, was admitted as a voluntary patient on 3.ii.47. According to his relatives he had been in good health until December, 1946, when he became depressed and agitated, blamed himself for having led a wicked life and expressed fear of punishment. Sleep and appetite were poor. On admission his physical condition was found to be very satisfactory for his age. He did not show signs of arteriosclerosis. Blood-pressure 120/65. There were no signs or symptoms of an organic nervous disorder. The reflexes were normal. Patient was severely depressed and agitated ; he expressed ideas of unworthiness, blamed himself for having masturbated in his younger years, and for not having offered to marry a girl whom he met thirty-five years ago. He complained about insomnia and frontal headaches. There were no signs of intellectual impairment. Orientation was intact. General knowledge and knowledge of current events were very good. He carried out arithmetical tests promptly and accurately and could recall a date and an address after half an hour. The diagnosis was agitated depression in senio. In view of the severe depression, electric convulsion treatment was instituted.

The patient had four treatments between 8 and 15 February, following which the depression subsided completely.

On 12 March the patient complained that he was unable to read, although he could recognize single letters. He said that his vision was blurred. The patient presented the syndrome right-sided homonomous hemianopia, word blindness and colour agnosia. He had no difficulty in naming objects, nor did he show any other features of dysphasia. Spontaneous writing of words and figures as well as writing on dictation were unimpaired. The patient used capital letters and punctuation marks correctly. When copying, he showed, like Case 1, a marked tendency to imitating peculiarities of the presented patterns. Constructional ability was unimpaired and he could draw simple geometrical figures correctly. Orientation in space and on his own body was unimpaired.

The patient was unaware of his hemianopia. He complained about his vision in the same way as Case 1. Acuity of vision was $\frac{6}{9}$ (corr.).

Reading.—Single letters of any type were, as a rule, recognized correctly. In reading the patient did not avail himself of non-visual aids. Occasionally he failed in recognizing a letter of angular and rather complex pattern, such as " W " or " E." Tachystoscopic examinations were not carried out. In trying to recognize

letters written on his skin, similar mistakes occurred as in visual reading. Arabic figures of any size, with and without decimals, were read correctly. The patient was able to carry out sizable multiplications (such as 244 × 7) and other oral arithmetical tests of a similar range accurately. On paper he could operate correctly with much higher figures. In trying to read Roman figures he failed in exactly the same way as Case 1, being unable to recognize figures beyond IV. In attempting to read words he behaved in the same way as did Case 1. He could recognize spelling mistakes and fill in missing letters if the word consisted of not more than three syllables.

Colour vision and recognition of colours.—The patient did not show signs of defective colour vision. In the Ishihara test his responses were normal, although he very often failed in naming the colours of the dots correctly. He made mistakes in naming and sorting colours. He was less inconsistent in his mistakes than Case 1. Certain misnomers occurred more frequently than others. Green was hardly ever named correctly. The lighter shades of green were frequently called " yellow " or " yellowish " and sometimes " bluish." The darker shades were as a rule called " blue." Red was sometimes called " brown." A dark brown was often called " black " and sometimes " purple." Similar mistakes were made in describing colours of objects presented to him. Like Case 1, he often qualified the colour named by appending the suffix " ish." When requested to sort skeins of coloured wool he failed in differentiating blue from green, and light green from yellow.

When tested for colour imagery he made mistakes almost identical with those of Case 1. In a series of tests he named the colours of a raspberry, a cigar, grass, crow, correctly. A goose was described as " greyish," a lion as " doubtful greyish," an elephant as " blackish to brownish," a frog as " brownish," a daffodil as " yellowish."

When requested to enumerate objects of a certain colour from memory his performance was poor ; for instance, when asked to enumerate red objects he named " red ink, red pencils, red dresses, red frocks, red paint." When pressed to mention objects which were red by nature he only named poppies. He found it generally difficult to list objects belonging to a certain category and, like Case 1, had to imagine real situations when trying to do so.

Progress notes.—The patient presented the syndrome described above for only two weeks. On 26 March he complained about being confused. Clinical examination revealed a severe nominal aphasia with marked paraphasias. Understanding of spoken language was slightly impaired. In writing he showed the same type of paraphasia as in speaking. He was unable to read and to name colours. As a rule he did not even attempt to do so. He was very distressed about his disabilities and gave up immediately he found a task difficult to perform. His condition deteriorated rapidly. On 25 March he was unable to express himself and the only residue of his speech was the recurrent utterance, " I shall be all right," with which he responded to questions put to him. A right-sided hemiparesis developed, more marked on the arm than on the leg. On 27 March the right extremities were completely paralysed and the patient gradually lapsed into unconsciousness. He died on 29.iii.47. Permission for post-mortem examination was not granted.

Comment.

The patients presented the syndrome of alexia with colour agnosia, which was associated with a right-sided hemianopia. Only a small number of cases have been reported in which this syndrome was not complicated by marked aphasia and disorientation in space. Although typical in many respects, the two cases showed some uncommon features which deserve comment. The alexia could be described as word-blindness with partial letter-blindness. In the majority of cases of word-blindness the recognition of letters is not entirely unimpaired, but little is known about the type of mistakes which word-blind patients tend to make in reading letters. The partial letter-blindness in the two cases pre-

sented above was typical of the visual alexia (Pötzl, 1928) in cases with occipital lesions. In those cases the errors in the recognition of letters are visually conditioned, i.e. they can be explained by incomplete visual comprehension of the shapes of the letters. This type of mistake distinguishes the visual (occipital) alexia from the parietal or temporal in which the paraphasic element can be traced.

It is worthy of interest that the type of letters which Case 1 frequently, and Case 2 sometimes, failed to recognize was the same which patients with impairment of epicritic cutaneous sensibility find it difficult to identify when they are written on the skin. The present writer (1927), in a study on the tactile perception of movement on the body surface, has found that patients with disturbance of superficial sensation fail in comprehending angular geometrical figures written on their skin much earlier than in the recognition of circular ones. The similarity between this type of impairment of tactile perception and the errors of partial letter-blindness is of interest as it suggests a more intimate relationship between perception and recognition than is often assumed.

Word-blindness lends itself even more than other disabilities of higher cerebral functions to interpretation in terms of Gestalt psychology. There can be no doubt that the word-blind patient has lost the ability to conceive the word as a unit and that he tries to overcome that disability by proceeding piecemeal, reading letter by letter. His mistakes in reading letters can also be interpreted as the expression of an inability to comprehend certain configurations as wholes. It is not a coincidence that the patients found it most difficult to identify letters of angular shapes which are more complex than the circular ones, and, as configurations, lack completeness. However, it is well to remember that the ability to comprehend organized wholes is not a function which can be isolated from the process of perception. This has again been stressed recently by Goldstein (1943), who introduced Gestalt principles into the analysis of cerebral symptoms.

These patients, like other cases of " pure word-blindness," read words by spelling them. By attempting to read sentences or long words by that method they failed badly and appeared almost completely letter-blind. This is an example of a breakdown of a mechanism of compensation by the help of which the patient attempts to circumvent his disability. The difficulty of the task produced what Goldstein called a catastrophic situation.

Writing is, as a rule, unimpaired in cases of word-blindness. The writing in Case 1 showed certain abnormal features. They were, however, not typical of any known form of agraphia, but could be attributed to the alexia. The occasional omissions and repetitions of letters and syllables can be explained by the patient's inability to read his own writing. The failure to use capital letters at the beginning of sentences and the absence of punctuation were probably due to the same cause. The patient wrote as he spoke. The use of capital letters at the beginning of sentences and the application of punctuation marks are late acquisitions in the learning of written language. In word-blindness the visual comprehension of sentences as organized wholes is lost and this is obviously the cause of this patient's inability to use the demarcating symbols. However, it remains to explain why a word-blind person, even if

he be unable to recognize punctuation marks, should not apply them in writing in the same way as he writes words that he cannot read. Possibly the length of the period over which the alexia has been in existence, i.e. the time of the disuse of punctuation marks, is the decisive factor. The patient, while trying to overcome his word-blindness by spelling single words, had long given up any attempt to read sentences, and punctuation marks have ceased to be of any use to him from the moment he has become alectic. Disuse of that group of symbols, which are the latest acquisitions in the process of learning to write, and the use of which remains precarious even in many normal subjects, may be responsible for the inability of some word-blind patients to recognize and to use punctuation marks. In Case 2, where the alexia existed only over a short period, the use of, and the ability to read punctuation marks were intact. It must also be taken into consideration that punctuation marks form a group of symbols in the acquisition of which acoustic aid, which plays such a great part in learning to read and to write, is almost negligible. This is probably one of the reasons why the acquisition of their correct use is difficult and why this ability is particularly vulnerable in cases of reading and writing disorders. The present author is not aware of any special observations on the use of punctuation in congenital word-blindness reported in the literature. It should be expected that in those cases the acquisition of the correct use of punctuation would be found to be more difficult than normally.

An interesting feature in both cases was the intactness of the ability to read Arabic numerals of any size, while the ability to read Roman figures beyond IV had been lost. One of Pötzl's (1928) cases showed exactly the same symptom. The patients described here attempted to read Roman figures in the same way as Arabic numerals. The only explanation for this discrepancy is again late acquisition and disuse.

The patients' ability to name colours was impaired, although they were not colour-blind in the usual meaning of the term. Wilbrandt (1887) described that symptom as amnesic colour-blindness and regarded it as an aphasic disorder. Lewandowsky (1908) attributed it to a dissociation of the conception of colours from that of objects. Sittig (1921) was the first to note that those patients often failed in sorting colours, which proved that the symptoms could not be of the nature of an amnesic aphasia for colour names. In his view that disability was the result of a combination of visual and aphasic disorders, the difficulty in sorting colours being due to the visual-agnostic component. Gelb and Goldstein (1918), rejecting all previous theories, expressed the opinion that the disability was the result of an impairment of "categorical behaviour." Patients in whom this basic function is affected behave and think in a primitive manner, i.e. according to the concrete situations in which they find themselves. They tend to name and sort objects according to their likeness, and to the way in which they fit into concrete situations, rather than as representatives of certain categories. The authors found the same impairment of categorical thinking in a variety of symptoms due to cortical lesions, particularly in amnesic (nominal) aphasia. This is not the place to enter into a discussion of this theory, the general applicability of which has been widely debated (Mayer-Gross and Guttmann, 1936, a.o.). The cases presented above showed

a variety of features similar to those on which Gelb and Goldstein's conceptions were based. In sorting colours the patients tended to choose more according to likeness than to categories. When enumerating objects belonging to the category they imagined concrete situations. In naming individual colours Case 1 often referred to concrete objects of the same colour. However, it is open to doubt whether the impairment of categorical behaviour which can be demonstrated in certain cases of colour agnosia is really the basic disorder underlying that disability, or if it is not, as Pötzl (1928) suggested, secondary to a disturbance of visual functions which still requires elucidation. The cases reported here showed certain features which it would be difficult to fit into the above theory. Although they were not colour-blind in the narrow sense, their references to their visual impressions in general, and the qualifying terms (" bluish, yellowish," etc.) which they used in describing colours in particular, suggested that colour perception was not quite intact. It is, however, still impossible to define in what way it deviated from normal. It is of interest that there are certain features which colour agnosia shares with defective colour vision. The differentiation between green and blue which is invariably impaired in colour agnosia is known to be difficult in anomalous trichomatic subjects whose colour vision is constitutionally inferior. Some errors which the patients presented above and others reported in the literature made in naming colours were reminiscent of the errors of colour defective persons, who, as Wright (1946) has pointed out, describe at various times the same stimulus by several different names, or call different stimuli by the same name. White and black are, as a rule, recognized in colour agnosia, as well as in defective colour vision. Their description as " whitish " or " creamish " and " blackish " suggests some abnormality of perception. Pötzl (1928) has assumed that lesions of the cortical fields adjoining the area striata tend to modify the functions of the latter and the observations reported above lend weight to that theory. One of the results of that modifying influence seems to be an interference with the established correlations which exist between colours and their names.

The two cases demonstrate that the difficulty in naming colours is not part of an aphasic disorder. Case 1 showed only a very slight disability in naming objects at a time when the naming of colours was gravely impaired, Case 2 none at all. The cases described by Brain (1941) and A. Adler (1944) in which colour agnosia was observed without any signs of aphasia demonstrate equally clearly that the symptom is independent of a disorder of speech. Such observations argue against Nielsen's (1947) contention that colour agnosia is an aphasic disorder, the impairment being one of symbolization. Pötzl (1928), in describing the symptom as aphasic, made it clear that he regarded it as a basically agnostic disorder resulting in a difficulty of naming.

It is noteworthy that in Case 1 the colour agnosia improved while the word-blindness remained unaltered. The improvement of the former might have been due to the development of mechanisms of compensation in the brain. Frequent testing probably stimulated such a process. The fact that the word-blindness did not show the same improvement suggests a functional independence of the two symptoms of each other. The regular combination of

visual alexia with colour agnosia cannot be explained on psychological or physiological grounds. It is obviously due to an intimate anatomical relationship of the cerebral structures, the lesions of which are responsible for the symptoms. Congenital word-blindness, which has a different pathology, is not associated with a disability of naming colours.

The clinical observations presented cannot contribute directly to the pathology of the syndrome which was obviously the result of a localized vascular lesion in both cases. Since Déjerine (1892), pure word-blindness has been associated with lesions of the left gyrus angularis, of its connections with the visual area and of the splenium corporis callosi. More recently cases have been reported in which the lesions were localized in the lingual and fusiform gyri of the left hemisphere and the validity of Déjerine's localization has been questioned, especially for cases in which word-blindness was not associated with agraphia and disorientation in space (Bouman, 1928 ; Pötzl, 1928 ; Brouwer, 1932 ; Kleist, 1934 ; Weisenburg and McBride, 1935). It is worthy of note that in the case reported by Hinshelwood, MacPhail and Ferguson (1904) there was extensive destruction of the left fusiform and lingual gyri, while the angular gyrus was not directly affected. For this reason Pötzl classified the word-blindness of the type described in this article as occipital alexia. At the time when the pathology of pure word-blindness was first studied much less was known about the sympatomatology of angular lesions than is known to-day. It is therefore of interest to note that pure word-blindness has never been found associated with Gerstmann's syndrome which results from lesions of the left angular gyrus. This argues, from the clinical point of view, against the assumption that damage to that area or its immediate neighbourhood is responsible for pure word-blindness.

Summary.

Two cases have been reported which presented the syndrome of visual alexia with colour agnosia in unusual purity. The alexia was of the nature of a word-blindness with partial letter-blindness. The types of errors which the patients made in reading letters have been analysed. Certain abnormal features in the writing of Case 1 have been shown to be related to his alexia. The patient did not write capital letters at the beginning of sentences and he was unable to read punctuation marks and to apply them in writing. The significance of those disabilities has been considered.

The various theories on colour agnosia have been discussed. Certain features which colour agnosia has in common with defective colour vision have been pointed out. During the period of observation the colour agnosia in Case 1 improved considerably while the alexia remained unaltered.

The cerebral localization of the lesion causing the syndrome has been discussed.

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THE SYNDROME OF ALEXIA AND AMNESIC APHASIA. SUBARACHNOIDAL HAEMORRHAGE WITH SYMPTOM OF PARTIAL OCCLUSION OF THE SPINAL SUBARACHNOIDAL SPACE.

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Introduction.

Amnesic aphasia has a peculiar position within the aphasic disorders, and it has always been found difficult to bring it into any aphasic scheme. The nearest to it in Head's (1926) classification of symbolic disorder is his nominal aphasia. This, however, is actually a sensory aphasia, in which the difficulty in finding words prevails; it has lost all the characteristics of the classical amnesic speech disorder. Goldstein (1926), on the other hand, while stressing the existence of the amnesic aphasia as a definite and well-circumscribed type of disorder, denies that it has anything to do with a speech defect—an opinion up to then held. According to him, it is fundamentally a defect in the thinking process in which the patients have sunk to a lower and more concrete level of behaviour. They have, according to Goldstein (1926), lost the categorical meaning and use of words; they may be able to name an object in a concrete situation, but are unable to generalize, to use the word in its class meaning. Since then this question has been critically examined by several authors (Hauptmann (1931), Isserlin (1936), von Kuenburg (1930), Lotmar (1933), Scheller (1938)) in the light of Goldstein's conception. In their conclusions, repudiating Goldstein's opinion, they reaffirmed the classical view of a basic speech disorder in the amnesic aphasia.

Word-blindness occurs mainly in two forms in localized brain lesions: firstly, in connection with aphasic symptoms, when it is regarded as an expression of defect in internal language; secondly, on a visual-agnostic base, sometimes accompanied by lesser symptoms of an agnostic type. In the Wernicke-Déjerine (1892) conception, the term "pure word-blindness" has been used for cases showing no defect of internal language or writing. In recent publications there has been a tendency to disregard these guiding principles, and to speak of "pure word-blindness" in cases where the defect in reading is the most outstanding symptom. There is hardly any case in the literature where the alexia was completely pure. Among the purest cases known one finds slight difficulty in writing, visual disorders—especially colour-agnosia—and as the most frequent concurrent disturbance, amnesic aphasia. Neurologically a contralateral homonymous hemianopia is a frequent and usually isolated

sign. This syndrome of word-blindness, amnesic aphasia, and homonymous hemianopia (here of the superior quadrant) is the outstanding feature of the case described.

Case history.—J. P—, a woman, aged 47, who had complained of feeling ill for about a fortnight, suddenly became semi-comatose ; she was admitted on the same day to the Bristol Royal Infirmary in a drowsy condition.

12.x.46 : On her examination in this hospital, neck rigidity and Kernig's sign were found and haemorrhages in both retinae. There was albumen and sugar in the urine. Blood pressure was 160/100 ; pulse rate about 80. Knee jerks were absent. Lumbar puncture showed blood-stained fluid and the pressure was 300. After lumbar puncture the patient appeared to be more alert and responsive. Two days later, after another lumbar puncture, she became confused and talkative. At the third lumbar puncture, two days later, it was noted that although the pressure climbed slowly to 300, the fluid dripped out at about one drop per second. Next day the patient became more confused, started singing and throwing herself about, and had to be kept under sedatives. This state persisted until a week later, when she was transferred to the Bristol Mental Hospital (25.x.46). During this time there was no change in her somatic signs.

25.x.46 : On admission she was quiet, responsive, and co-operative, but she showed a profound confusion, with complete disorientation in time, space, surroundings, and her own self. She was uncertain about her age and her name, and denied that she had a husband and child. She could not give any definite account of the remote or recent past, and was unable to reproduce any of her acquired knowledge. Frequently, when questioned she said she was unable to think, and her final answer was that she did not know.

Though her spontaneous speech was generally fluent, without paraphasias, she often had difficulty in finding the right word ; this disturbance became obvious when she had to name objects. Often unable to find the right name for common articles, she always tried spontaneously and successfully to define them.

Neurologically there was a small haemorrhage in the otherwise normal right fundus ; the fundus of the left eye could not be seen clearly, owing to a recent haemorrhage into the vitreous body. Stiffness of neck and Kernig were still present. Cranial nerves (a perimetric visual field was not done at this time) appeared intact, and there was nothing abnormal in the upper limbs. There was, however, a paresis of the lower limbs, more marked on the right side than on the left. Both knee jerks and ankle reflexes were low but present, and on both sides there was a dorsal response of the big toe. Muscular tone was somewhat decreased ; superficial and deep sensory qualities were everywhere intact.

A few days later a more comprehensive examination was possible. Her confusion was now less severe, though she was still gravely disorientated ; she was able to give patchy general information about herself, but her answers were still slow. She would answer all questions in a rather stereotyped way—" Let me think ; I have to think." The nominal aphasic and alectic disorders, which were studied in detail in a succession of examinations and which attracted our main interest, will be described later. Her speech, apart from occasional difficulty in finding the right expression, was fluent, with no paraphasias or grammatical errors. Abstract words, even the more uncommon ones, were well defined, and she was always sure of their meaning. Her understanding was excellent. Her right-left orientation was faultless. She pointed to her fingers and various parts of the body named promptly, except for the shin-bone and thigh, over which she regularly made mistakes, which might indicate isolated slight defects in her understanding or in body orientation.

Her visual-agnostic functions were practically intact. She recognized articles and simple pictures immediately, and was able to give a detailed description of complex situational pictures. She picked out any article from a large number exposed (in spite of her visual field defect), and did simple jigsaw puzzles reasonably quickly. She recognized colours, and had little difficulty in naming them ; in sorting them out she was at first hindered by their varying degrees of brightness, but when she understood that only colour and not brightness mattered, she sorted them successfully. She was immediately aware of a missing part in a drawing

and completed it promptly; only in one instance where part of a bicycle was drawn in a schematic way was she unable to say what it represented. Her visual memory was fairly good, and she had no difficulty in visualizing persons, objects, or living things. Her orientation in place was good: she described familiar routes and places well. Her orientation on the map of England was about what one would expect of her educational level and interests. She was able to estimate absolute and relative distances fairly accurately.

Her drawing was very good and showed skill above the average. Her free-style writing was fluent, and the character of her writing was the same as before her illness. She occasionally made spelling mistakes, especially in long words, and she also made some mistakes in dictation. When she had to copy she could not be induced to keep strictly to the text; first she tried to read or spell it, and then she wrote it down according to her own reading. She copied geometrical figures well, and picked out promptly all the single figures in a complex drawing composed of different figures.

She was unable to do even the simplest calculations; the best she could do was to write single and compound figures correctly, the latter up to a thousand. From there on she became uncertain about the position value. She apparently understood figures up to twenty; these figures she was able to mark with her fingers. Occasionally she succeeded in adding two simple figures together. That was roughly the limit of her capacities. She had no conception of subtraction, multiplication, or division, and no idea about the method—whether she had to do it orally or in writing. She could not write down decimals at all, and fractions uncertainly, and only after she had worked her way up from the familiar half. Plus, minus, division and multiplication signs had no mathematical meaning for her; characteristically, when a multiplication sign was shown her by itself, she interpreted it as a kiss in a letter. In contrast to this she explained a question-mark correctly.

Language in relation to naming: as mentioned before, her conversational language was, apart from occasional hesitation when she had difficulty in finding the proper expression, fluent and correct. She never failed to follow conversation, was able to carry out all the orders given to her, and understood and could define difficult abstract expressions. She was able to give an appropriate interpretation of proverbs. She showed, however, a very marked disturbance in naming objects. The difficulty in producing names appeared under various circumstances. When asked, for instance, to name all the flowers or animals or something similar, her answers were extremely poor; she had to think a long time, and in the end gave only two or three names. She was equally unsuccessful when asked to form a word from a given initial letter. Her failure was not confined to nouns. She failed consistently in giving synonyms for words such as " nice " and " big," and opposites for words like " ugly," for which her answer was " not ugly." These are representative examples of a number of similar reactions. She was, on the other hand, able to generalize, to find the common property contained in a variety of objects named; she did much better in finding the generic name than in the previous problems, when she had to produce a larger number of words; but even when she failed to form the exact expression she could always make it clear that she had the right conception. She had no difficulty in forming a sentence out of two or three given words. Her spelling was good, with only occasional mistakes.

Reading: she was consistently unable to read the letter X, and with a few other letters, such as P and R, she was often doubtful; she was less certain with capital than with ordinary letters. It did not make any difference whether they were printed or written. She made the same mistakes feeling wooden letters when blindfolded. She could read simple figures correctly and complex figures without error in position up to a thousand. She was much less certain about letters when she had to spell a word than when she had to read single letters. When letters were distributed on a paper at some distance from each other, she had great difficulty in finding the letter required; she was, on the other hand, very prompt in finding a figure named among figures written in the same way. It took her a long time to find a letter out of a pack of cards on which the letters were printed; she did it inaccurately. When capital letters were written on her palm whilst she had her eyes closed, she made mistakes as in reading, failing with the same letters, although again the identification of figures was prompt and correct. The reading of words

and even more so of sentences was gravely disturbed. She succeeded relatively frequently in reading a short word, but almost invariably found difficulty with longer words ; in these the ending confused her most, and she often remarked, " It looks strange." She consistently tried to spell the word first, and by these means proved more successful. She never failed to understand and interpret the word she read correctly. To our surprise she was also able to give the meaning of a word she could not read. She would read the word paraphasically or say she could not read it at all, but when asked what it meant would give the correct interpretation ; and after a while she would even name the word correctly. When a number of different words were written on a paper and she had to point to the words named she was successful in about two out of five cases, but it always took her a long time to pick these out. The result was the same when the words chosen were of similar spelling. She rarely succeeded in putting the right letter in an incomplete word, and did so only when she had completed and comprehended the word by her attempt to read it. Similar results were obtained when she was asked to pick out the correctly spelled word from three different versions. The longer the sentences and the more lines she had to read, the poorer were the results ; her difficulties were essentially the same as with single words. She was sometimes able to complete a sentence in which a word was left out, but only when she was able to read and understand the part of the sentence presented to her. Usually she did not find any sense and was consequently unable to suggest an answer. The most striking findings were the instances where she gave an approximate interpretation of writing which she could not read. Examples will illustrate this : she was asked to read the following print : " D is for donkey standing still, a ride on whom is such a thrill." She read : " D is for donet I stand ilt," saying " that what it looks " ; " mechan and is like a chander." When asked what it meant, she said immediately : " A little donkey, he got to stand still—and then they meet him and tell the ass to stop pretty quiet." When asked again to read it, she said : " I cannot tell what they are, but they come back into my mind afterwards " ; and on the next attempt, " It looks to me like isander and something about food." When asked to read the word " still," she said, " I should call it nearth." When asked to spell it she first spelt it " stell," then correctly, also understanding its meaning. Asked to read " a ride on him," she read the first two words correctly, but still could not read the next ; she said " duch," then " it spells duck," and finally she said, " Such, I cannot tell you what it is." She had still greater difficulty in reading her own writing, declaring " It is all wrong " ; at the end of a letter to her husband she apologized for her bad writing, saying she could not re-read it.

In the course of investigations extending over a period of three months she made considerable improvement ; first her general orientation and her memory became better, and the progress was so rapid that after about six weeks her previous capacities were almost completely restored. Next the amnesic speech defect and the alexia improved, but in both considerable defects were still present ; the type of the disturbance, however, was fundamentally the same as at the beginning of the examinations. Finally, only very slight progress was made in calculations.

According to the history given by her husband she used to be a stable person of average intelligence, with an elementary school education ; she was very fond of reading, a good writer, and especially good at spelling. She also had some skill in drawing, but she was always poor at figures ; she never could do more than simple sums, and this only laboriously. The patient was outspokenly righthanded.

Discussion.

The disorders in this case—excluding the neurological signs—following a subarachnoidal haemorrhage consisted of a severe memory loss with lack of thought material and disturbance in thought process, an acalculia, an amnesic aphasia, word-blindness, and slight errors in writing and occasional spelling mistakes.

The memory and thinking capacities returned to normal after about four weeks, whilst the other defects, though improved, were still manifest at the

conclusion of our examinations after an illness of three months. It must be mentioned that among the functions affected there were some in which the patient had had a particularly high efficiency and others in which she was poor before the illness ; while some functions in which she had a high degree of skill and practice were heavily involved, others remained almost intact. The distribution of functional loss was, therefore, in our case not related to the degree of skill and automatization of particular functions.

In our investigations of the amnesic aphasic disorder, we have considered whether the difficulty in finding words should be attributed to a primary defect in speech or to a more general disturbance. It is hard to deny that there were reactions of our patient which, when considered separately, appear to favour Goldstein's interpretation of a categorical disorder ; she had difficulty in finding a reasonable number of representatives subordinated to a definite collective conception ; in sorting of colours there was some tendency to Goldstein's primitive behaviour when at the beginning the brightness of the colours interfered with her principle of classification. She was, however, on the other hand, quite capable of thinking in an abstract manner : she could describe the meaning of the collective name for a number of representations, for which she was unable to find the proper expression ; she easily grasped the meaning of a short story and could give an abstract of it, and her interpretation of proverbs was prompt and accurate. But, though the trend of her thought was generally correct, she always had difficulty in phrasing it correctly. Special tests carried out to determine the broadness of this defect demonstrated clearly that the same defect was present in the entire field of speech. It became clear, when she had to form as many words as possible from a given initial letter, that at the most she could think of only two or three words. She failed when she had to produce synonyms or antonyms of a given word ; characteristically, when asked to find the opposite of ugly, nothing except " not ugly " came into her mind. Also there was a definite change in the way she expressed herself in ordinary conversation and in descriptions ; she seemed to use extremely simple language with little variations in her vocabulary, while at the same time retaining the fluency of her speech, even in the first period of the observation. Alterations in the style of speech, however, are difficult to assess without detailed knowledge of a patient's speech behaviour before the suspected change. We know that our patient was relatively well read, and the more she improved the more evidence we found that her potential vocabulary was, indeed, very good. We also had the opinion of her husband, who took a great interest and was an acute observer ; he agreed that her speech had become much simpler. The most valuable information on this point was given by the patient herself in an attempt to describe her difficulties, when she said : " They (thoughts ?) come up into my brain and I cannot say them, and I think of the nearest I can say." Speaking in general terms, one can make the statement that the patient's language sank to a lower and more primitive functional level. If we take the spoken word as a result of a psychological process progressing from thought to expression, we can, following A. Pick (1913), distinguish a number of stages, the last of which, preceded by grammatical setting, is the choice of words. Our patient's grammatical setting was perfect, and there

were no signs that the inner language was at any other point at fault. It was then only in this last stage that the patient failed ; her speech, otherwise well prepared in thought and language, lacked the capacity of choosing or mobilizing the words adequate to the preceding scheme. Under such conditions the speech difficulties should arise whenever the word resources are put to the test ; this is, as we have seen, true for our patient. As to the amnesic aphasia in general, it has always been emphasized that the difficulties occur mainly when the patients have to name objects, and that they increase proportionately to the exactness of the answer required. Under these circumstances, indeed, the defect becomes as a rule very marked and can hardly be overlooked. In what way the speech behaviour is altered under other conditions, however, has been little investigated. Only after Goldstein (1926) raised the question of a categorical disorder, were more detailed investigations carried out (Kramer (1928), Wolpert (1930), Scheller (1938), Weisenburg and McBride (1935)). These examinations showed that amnesic aphasic patients are in word-need, whatever verbal situation arises. Wolpert (1930) describes significantly the spontaneous speech of his patient as " uncomplicated and poor in words." Weisenburg and McBride (1935) state that the speech of their amnesic aphasic patients contained a large proportion of ready-made expressions, colloquialisms, and automatic responses. This leads us to the opinion that the amnesic aphasia in its pure form is not mainly a nominal disturbance, but a disorder in which the word material available for the speech process is restricted, its mobilization inhibited. Consequently the language lacks all abundance, has lost its individual style, is poor in formulation, and simple in pattern. This defect becomes more embarrassing for the patient and more manifest to the observer when the patient has to name objects than in ordinary conversation ; to keep up conversation or to describe something in a simple way little resources are needed and substitutions can be used fairly freely. This is, in fact, as we found in our case, what the patients do. This recourse cannot be used when they have to name objects. As their flow of speech can be quite adequate, and as they are able to speak to the point, the broader defect can easily escape the observer.

We have referred to the various stages of verbalization as a basis for the psychological understanding of the problem. As experience shows, the complexity of aphasic disorders cannot be explained solely by this relatively simple scheme. In fact, it cannot be assumed that in the normal process of internal speech the various stages are sharply separated. Much less is it to be expected that a pathological process should select a particular stage with any regularity. Accordingly, cases of focal lesions with aphasia of exclusively amnesic type are rather exceptional, and amnesic aphasic reactions are found much more often as part of various forms of aphasia.

Though we had to come to the conclusion that the amnesic aphasia is not the expression of a general thought disorder of a specific kind, there certainly are close relations between disturbances in thinking and those in word finding. When we consider the course our patient's illness took, these relations are well indicated. At the onset a combination was found similar to that experienced in organic dementia, where the lack of thought material, dominating the picture, could have been made responsible for the amnesic aphasic reactions ;

it is indeed not easy in such combination to disentangle one from the other. But later, with gradual restitution of the thought process, the amnesic aphasia became more isolated, and more evidence could be collected to prove its independent character. We believe that this sequence of a defect in thought material giving way to an incapacity to mobilize word material is not purely accidental.

Two forms of alexia in its classical meaning, a literal and a verbal form, have been distinguished. Patients with literal alexia (Déjerine (1892), Hinshelwood (1895), Bonhoeffer (1903), Wolpert (1930), *et al.*) are unable to identify letters; in verbal alexia (Dejerine and Thomas (1904), I. V. Paterson (1905), Dide and Botcazo (1902), Bonvicini and Pötzl, Kramer (1928), *et al.*) the identification of letters is comparatively good and the main disturbance is found in the reading of words. There is no sharp distinction between these two types; our case, a verbal alexia, showed many characteristics described in both of them. In accordance with other observations, our patient was unable to copy though able to write on dictation. She was unable to read her own writing and, as she was unable to check writing, it did not make any difference to her whether she wrote with open or closed eyes. It is also a common finding that reading of figures is preserved, as it was in our case. In most cases the patients fail in particular letters consistently; these are often, as in our case, the letter X, those letters which are in little use; the selection is then according to Ribot's rule. But frequently quite common letters may cause special difficulties, as in our case P and R, where a psychological explanation can hardly be given. She did comparatively well with single letters, much worse when a large number of letters were presented to her at the same time, and still worse again when they formed part of a word. The longer the word the more she became confused, and the end syllable usually appeared completely strange to her. As her visual field was restricted, a peripheral cause for this reaction might be suggested; such peripheral factors in word-blindness have been specially stressed by Beringer and Stein. We found, however, that our patient had no difficulty whatever when pictures or objects were concerned; she was able to pick out promptly a particular one from a number of them. There was also a significant contrast between letters and figures; when in one experiment letters and in another figures were dispersed over the same area, she could easily pick out the figures named but not the letters, and had great difficulty with those which she was able to read singly. This defect in the apperception of symbols is therefore selective.

In some respects the reaction is reminiscent of that seen in Pick's (1913) apperceptive blindness, where pictures cannot be apprehended in their totality, and partly of those seen in simultaneous agnosia (Wolpert), in which the patients are able to recognize details without being able to combine them into a whole. The fact that a larger entity of written symbols has a confusing effect upon the patients is also brought out by their reading procedure. It has been noted by a number of authors that the patients in their attempts at reading go along the letters singly with their fingers, or even uncover each letter separately. Our patient showed principally the same approach; in the beginning of her illness she read letter by letter, and she never could be induced to do without this

procedure. In later stages, when her reading had improved, she succeeded more and more without this help. In her letter-by-letter reading, especially in the beginning of her illness, she often made mistakes in the identification of letters ; she then produced the word with these mistakes in it. If, on the other hand, her spelling of the letters was correct, so was the final result. Thus she transferred her visual impressions piecemeal into the sphere of language, so as to come to a total conception of the word, to a " gestalt " which she was unable to obtain by visual gnostic means. This tendency to draw on other resources in order to bridge the functional loss is partly the reason why, as reported, some of these patients with alexia make writing movements with their fingers while reading. These responses demonstrate also how these patients are compelled to replace a simple proceeding by a complicated round-about way, and how a normally automatic act becomes de-automatized.

The most remarkable reaction of our patient was her ability to interpret words or parts of a sentence without being able to read it ; in such circumstances she declared that she could not read at all (" It looks quite strange to me "), or she produced a paraphasia which had not the least similarity to the written word. The paraphasic reading with correct interpretation would not be surprising if the patient also had paraphasias in her spontaneous speech ; the internal speech was, however, apart from the amnesic factor, completely intact. One could, with some justification, assume that she came to the meaning of the word by completing words incompletely read ; she certainly often guessed, which is well demonstrated by her occasional tendency to confabulation. Though completing and guessing had part in her responses, it is significant that she was under these circumstances never able to produce the actual word, but consistently used definitions and circumscriptions. Only after she had done so might the correct expression sometimes appear. This behaviour is thus strikingly similar to what we have seen in her amnesic-aphasic reactions ; though unable to get hold of the expression itself, she grasped the meaning. Although we did not find an identical reaction in the literature of word-blindness, reactions of amnesic type are mentioned in the cases of Hinshelwood (1895) and Wolpert (1930) ; these authors describe that their patients could often name and identify a written letter only after they had said the whole alphabet up to the particular letter. This suggests that there is a common factor which interferes with the mobilization of the written word as well as with that of the spoken word ; this finding provides, at least for some cases, a psychological explanation for the syndromal appearance of amnesic aphasia and alexia.

From the patient's own statement and from our discussion it is, however, quite clear that in the foreground of the alectic picture in our case are those reactions which show that her main difficulties were of the visual agnostic order. It is obvious that in such functions as reading, which is based on speech as well as on visual apperception, both disorders of speech and visual gnostic disorders may produce a defect in function. This is confirmed by clinical experience and has been fully recognized. There are cases of aphasia in which alexia is a predominant feature, and a number of pure alexia in which the word-blindness appears to be a residuum of a general agnostic disorder

and often minor agnostic disturbances can still be discovered. In cases where an amnesic aphasia combines with word-blindness, an amnesic factor may, as our case demonstrates, be partly responsible for the otherwise agnostic type of word-blindness.

Our patient's approach to the written word was interesting. The procedure of reading became de-automatized, and each written word became a new problem to be laboriously solved. She was unable to approach the word as a whole, and had to build it up from partial impressions. In doing this also her procedure was unusual ; she transferred the partial impressions of the visual agnostic sphere into that of language. Disturbances of this kind have often been considered fundamental to the specific disorder ; but similar alterations in the working mechanism are found wherever functions of a higher order have disintegrated—for instance, in aphasic and apractic disorders. It is therefore more likely that these are signs of de-differentiation at a certain functional level rather than the basis of a specific disorder.

The last of the more outstanding features of our case which did not tend towards a complete restoration was the acalculia. In a few cases in the literature (Janota and Springlova (1930), *et al.*) calculation disturbances have been found to accompany word-blindness. Our patient is not a suitable case for analysis ; her abilities in calculation have certainly suffered, but she was very poor, much below the average, before her illness. Considering the relatively rare occurrence of acalculia in purer cases of alexia, it might well be that the combination of these two disorders is due to the special character of the lesion, as suggested by Springlova and Janota. But we must not forget that with faculties in close functional association the functional loss in one may have an effect upon the other. The intensity of this association depends upon the way the particular function has been built up, and is thus subject to individual variations. We can therefore well imagine that in a person whose calculations are tied up with visual imagery or based on reading procedure, an alexia could secondarily lead to difficulties in calculations. This remains purely theoretical for the acalculia in this case. Such functional interrelations are, however, much firmer between reading and writing and reading and spelling ; considering this, it is not surprising that almost all cases of alexia (Hinshelwood's case (1895) which is regarded as one of the purest, is no exception) show some difficulty in writing, and we see also in our case slight uncertainty in spelling ; distinguished from the main disorders by the very slight functional loss, they can be regarded as secondary symptoms.

This history of the sudden onset of a comatose condition preceded by headache, together with the finding of a haemorrhagic cerebro-spinal fluid, is suggestive of a subarachnoidal bleeding. The meningeal symptoms of neck stiffness and Kernig found in the examination are signs frequently seen in such conditions ; the same applies to the retinal and vitreous haemorrhages, which, moreover, suggest that one of the basal arteries was the site of the bleeding. As the patient did not suffer any injury, a rupture of an aneurysm, either congenital or arterio-sclerotic, was its most likely cause. Uncommon and confusing was the finding of a paresis of both legs, with pyramidal signs and loss of deep reflexes, without any other neurological signs. This is difficult to

explain as a consequence of brain damage ; assuming a lesion of the basal parts of the brain, a paraparesis with the signs mentioned without involving cranial nerves seems to be unlikely ; and again, considering the whole symptomatology, an involvement of the parasagittal region, which could have caused such symptoms, is still more improbable. There remains only the alternative of a spinal lesion, which would offer the easiest explanation. The finding at the lumbar puncture seems to support this explanation. Though no Queckenstedt was carried out at the lumbar puncture, it was noted that during it the pressure of the cerebro-spinal fluid rose only gradually till it reached the high level of 300 mm., and even then the flow of fluid was found to be extremely slow. This paradoxical finding can hardly be explained by intracranial pressure alone. It suggests in our opinion a simultaneous partial occlusion in the spinal subarachnoidal space ; such occlusion could prevent the immediate conduction of the pressure present above the block downwards, and could slow down at the same time the flow of fluid. The gradual rising of the pressure would necessarily follow the reduced rate in flow. It seems likely that a blood-clot had been formed in the spinal sub-arachnoidal space after the acute phase of the bleeding, causing the partial occlusion and giving rise to the neurological symptoms. This would also explain why these symptoms took clinically a course different from those which were caused by the brain damage.

As to the damage inflicted inside the cranial cavity, two phases, one more acute and the other more chronic, can be distinguished in the course of our patient's illness. The first consisted of a picture of a general mental disorder, whilst the other was of a circumscribed functional loss. The first started with a comatose condition, which was followed by a state of manic excitement, and this passed into a state of grave memory loss with reduced spontaneity and productivity. As there is every reason to assume that one of the basal arteries had ruptured, the main damage must have been done to the basal parts of the brain. Considering recent observations, it appears not unlikely that the mental picture had been caused by extravasation around the diencephalic region, and that it subsided after the extravasation had been absorbed.

As to the more stationary symptoms, the right-sided hemianopic defect, the alexia and the amnesic aphasia, there is fairly general agreement about the combination of the first two symptoms (Pötzl (1927), Weisenburg and McBride (1935), de Massary (1932)), that the left lingual gyrus in right-handed persons is of crucial importance. Since Déjerine first demonstrated in his case of pure alexia a softening of the basal parts of the occipital lobe, a number of similar clinical anatomical observations have been made (Déjerine, Hinshelwood (1895), Bramwell (1905), Brissaud (1900), Dide and Botcazo (1902), Ehrenwald (1930) *et al.*). The fact that the hemianopia of our patient is confined to the upper quadrant, pointing thus to an interruption of the lower fibres of the optic radiation, is well in agreement with a lesion of basal parts of the brain.

The lesions found in word-blindness are in the distribution of the posterior cerebral artery, or its branches (lingual artery) and involve the occipital temporal region. Pötzl (1927) is of the opinion that the extent and localization of the lesion within this area varies according to the associated symptoms. The syndrome of word-blindness and amnesic aphasia may thus be explained

in accordance with Foix and Masson (1923) by an extension of the lesion to the temporal lobe.

Summary.

A patient, semi-comatose after a subarachnoidal haemorrhage, passed into a manic state for several days, followed by reduced mental activity with severe memory loss. During this time there was amnesic aphasia, alexia, slight writing and spelling defects, and acalculia. There was gradual improvement, but three months later the special defects were still present, although memory and mental alertness had returned to normal four weeks after the haemorrhage.

At first there was loss of knee and ankle jerks and pyramidal signs, which soon became normal, and a paraparesis of legs, which recovered three weeks later. There was an upper right-sided homonymous quadrantic hemianopia, which remained unchanged.

Results of detailed investigations have been described.

It was of diagnostic importance that paradoxically the pressure of cerebrospinal fluid gradually increased during lumbar puncture with a slow flow, which was probably due to a clot causing partial occlusion of the spinal subarachnoidal space, with co-existing increased intracranial pressure.

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HISTOPATHOLOGICAL FINDINGS IN GENERAL PARESIS AFTER PENICILLIN TREATMENT: REPORT ON 4 CASES.

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There have been several deaths during or after penicillin therapy for G.P.I. (Goldman, 1945 ; Neymann *et al.*, 1945 ; Weickhardt, 1946, and Rose and Solomon, 1947), but there have been no reports of neuropathological studies. We think, therefore, that it may be of some value to describe the pathological findings in the brains of four such cases.

Case 1.—A man, aged 56, was admitted to hospital on 14 September, 1945. For about six months he had been somewhat agitated and restless, and had slept poorly. Three weeks before admission he had been questioned by the police because of peculiar behaviour, being sent to a public assistance institution, where he expressed grandiose and persecutory delusions, and was certified as insane.

On admission he was elated, garrulous, and poorly orientated for time and place. His memory was grossly impaired for both recent and remote events. Lips and tongue were tremulous, and he was dysarthric. The blood Wassermann reaction was positive at a dilution of 1 in 8. The cerebrospinal fluid contained 84 cells per c.mm., with lymphocytes predominating ; its total protein was 100 mgm. per 100 c.c., the Wassermann reaction was positive, and the colloidal gold curve was 5554433100.

Treatment was started on 29 September. A total of 2,400,000 O.U. of calcium penicillin was given in individual doses of 50,000 O.U. injected intramuscularly every 4 hours. Treatment was interrupted for a short period on 6 October because of an acute exacerbation (interpreted as Herxheimer reaction) in the patient's mental symptoms. It was completed on 7 October. During the succeeding week elation and euphoria disappeared, but grandiose delusions remained. Lumbar puncture was repeated on 22 October. The results were as follows : Cells 37 per c.mm. ; protein 5 mgm. per 100 c.c. ; Wassermann reaction positive ; colloidal gold curve 4553320000. On 29 October the patient developed lobar pneumonia. He did not respond to full doses of sulfamezathine and died on 14 November, 1945, 46 days after the institution of treatment. At autopsy the lower lobe of the right lung was found to be in a state of grey hepatization, with abscess formation at its upper pole.

The brain had been sectioned several times at autopsy before being placed in formalin, so that when received at the neuropathological laboratory it could not be examined satisfactorily from the gross anatomical standpoint.

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Histological investigation of the brain.—All the characteristic changes of general paresis were seen, but their intensity, especially that of the inflammatory process, was much less than is ordinarily encountered in untreated cases. The perivascular infiltration, even in regions such as the frontal and temporal cortex, was nowhere more than mild in degree (Fig. 1). In many cases it was almost completely absent (Fig. 2). Under high magnification it was apparent that while some of the large vessels in the affected regions showed moderate cuffing, the precapillaries and capillaries exhibited only a little, or none. The striate body was minimally involved, and the diencephalic centres, the brain stem and the cerebellum were almost unaffected. Microglial proliferation was likewise much less marked than is ordinarily seen in untreated cases, both in Nissl sections and after impregnation with silver carbonate. The iron reaction was positive in the walls of many small and medium sized cortical vessels (Fig. 3). Spirochaetes could not be found in silver impregnated sections taken from the frontal and temporal regions. Other changes encountered were thickening and fibrosis of the meninges, marginal glial fibrosis, and distortion of the cortical architecture caused by patchy or diffuse loss of nerve cells (Figs. 1 and 2). Many of the remaining nerve cells showed various degrees of acute, severe or chronic degeneration.

Case 2.—A man, aged 54, was admitted to hospital on 28 February, 1946. Eighteen months previously he had developed tremor of his extremities, had become unsteady on his feet and unable to go to work, and had discontinued all social contacts. For two months before admission his condition had gradually deteriorated.

On admission he was demented and euphoric. His memory for recent events was grossly impaired, and there was evidence of auditory hallucinations. He was in a poor physical condition, with heart sounds of poor quality, and arteriosclerosis of the peripheral vessels. The blood Wassermann reaction was positive at a dilution of 1 in 8. The cerebrospinal fluid contained 17 cells per c.mm., mostly lymphocytes ; the total protein was 150 mgm. per 100 c.c., the Wassermann reaction was positive, and the colloidal gold curve was 5555544110.

Treatment was commenced on 5 March, 1946, and consisted of a total of 2,400,000 units of sodium and calcium penicillin in individual doses of 50,000 units injected intramuscularly every 4 hours. It was completed on 13 March. Immediately following this he showed mental and physical improvement. His mood became normal; the tremulousness of the limbs was diminished, as evidenced by improvement in handwriting and walking. His auditory hallucinations were less marked. On 27 March examination of the cerebrospinal fluid showed 17 cells per c.mm., 90 mgm. protein per 100 c.c., Wassermann reaction positive and colloidal gold curve 5555553200. A second course of intramuscular penicillin, identical with the first, was given between 27 March and 4 April, 1946. Thereafter he showed further improvement ; his handwriting was better, his gait improved, and his hallucinations of hearing disappeared. Lumbar puncture on 20 May showed 4 lymphocytes per c.mm. and 60 mgm. of protein per 100 c.c. ; the Wassermann reaction was positive and the colloidal gold curve 5555543100. On June 21 his physical condition began to deteriorate, and he died on 28 June, 1946 (i.e. 108 days after the start of treatment).

Post-mortem examination revealed atheromatous and syphilitic involvement of the aorta. There was well-marked coronary sclerosis and fatty degeneration of cardiac muscle, and the liver showed severe chronic venous congestion. The brain weighed 1,150 gm. The meninges over the convexities were slightly opaque, and there was marked atrophy of the convolutions, particularly in the frontal lobes. The arteries of the base were normal, the lateral ventricles moderately enlarged.

Histological investigation of the brain.—The pathological changes were the same in kind as in Case 1, but more widespread and slightly more severe. Under low magnification some cortical areas, particularly in the central region (Fig. 4), showed little, if any, inflammation. In the frontal and temporal regions moderate perivascular cuffing was present (Fig. 5). The occipital lobes and the striate bodies were a little involved, and the globus pallidus, thalamus, brain stem and cerebellum only very slightly. Under high magnification precapillaries and capillaries were seen to be somewhat more heavily infiltrated (by both plasma cells and lympho-

cytes) than in Case 1. The meninges in all regions were thickened and fibrosed, and infiltrated mainly by lymphocytes. Loss of nerve cells, sometimes diffuse, sometimes more circumscribed, was seen in frontal, temporal, and even occipital cortex. The remaining nerve cells had lost their polarity, and displayed changes resembling mainly the acute and severe types of degeneration. In the motor cortex " chronic " cell change predominated, most of the pyramidal cells being shrunken, with triangular pyknotic nuclei ; the Betz cells were laden with lipofuchsin. The loss of nerve cells resulted in general disturbance of the cytoarchitecture, as shown in Figs. 4 and 5. Microglial proliferation was slightly more intense than in Case 1. The iron reaction was more intense and uniform than in Case 1, being strongly positive around the blood vessels of the cortex and the striate body. In silver impregnated preparations no spirochaetes were found after a lengthy search of sections taken from the frontal and temporal lobes.

Case 3 was a young woman, aged 27, of no occupation, admitted to hospital on 13 July, 1946. She was probably a case of juvenile general paralysis, although the evidence is not conclusive. She had been sociable and cheerful until the age of 21, when she began to show a character change, becoming bad-tempered and quarrelsome.

On admission she was disorientated for time and place, negativistic and difficult to examine physically. She was retarded in thought, and her memory for recent events was poor. She lacked insight into her condition, and harboured grandiose delusions. Her physical condition was poor, with decubitis ulceration of trochanters and sacrum. The blood W.R. was positive in 1 in 8 dilution. The C.S.F. gave a strongly positive W.R. (+ + +) ; the protein was 60 mgm. per cent. the cells 1 (lymphocyte) per c.mm. ; and the Lange was 5555554210.

Injections of 50,000 units of penicillin, intramuscularly, were commenced on 1 May, 1946, being repeated every 3 hours until 13 May, 1946, when a total of 4,850,000 units had been given. No C.S.F. investigation was carried out following treatment. She died on 30 May (i.e. 30 days from the start of treatment), after rapidly deteriorating both mentally and physically.

Post-mortem examination revealed no noteworthy changes in any organ except the brain, which weighed 1,040 gm. and which showed a moderate degree of generalized convolutional atrophy. The meninges were slightly opaque over the frontal regions, and the ependyma of the enlarged lateral ventricles gave the appearance of mild frosting. The basal arteries appeared normal.

Histological investigation of the brain.—Inflammatory changes were severe in the frontal, central and temporal regions, moderate in the occipital lobe and striate body, and slight in diencephalic centres, midbrain, brain stem and cerebellum. The meninges were everywhere greatly thickened and infiltrated. The small vessels in the cortex displayed the typical paretic picture of " wall-papering " by plasma cells. The cytoarchitecture of the occipital and, to a lesser extent, the central cortex was fairly well preserved, but frontal and temporal cortex showed diffuse outfall of nerve cells, particularly in the third layer, and much disorganization due to loss of polarity. Microglial proliferation was intense throughout the cortex and was also prominent in the white matter. " Frosting " of the fourth ventricle was conspicuous. There was some infiltration of the cerebellar leptomeninges and marked vascular cuffing and proliferation of microglia in the region of the dentate nucleus. The iron reaction was appreciably stronger than in the two preceding cases. Deposits in both microglia and adventitial histiocytes of vessels were widespread, being specially abundant in the frontal and temporal lobes. Careful search revealed no spirochaetes in silver-impregnated sections from frontal and temporal lobes.

Case 4, a youth, aged 20, was admitted to hospital on 5 June, 1946, having been for some months in a poor mental and physical condition.

It was reported that in 1934 at the age of 9 he had been discovered to possess a positive blood W.R. and had received anti-syphilitic treatment. At 17 he had collapsed, remained unconscious for some time, and had been admitted to the Manchester Royal Infirmary. The essential findings at this time were : Fixed pupils, variable strabismus and nystagmus, and diminution of all deep and superficial reflexes. The cerebrospinal fluid showed a paretic gold reaction (5555421100),

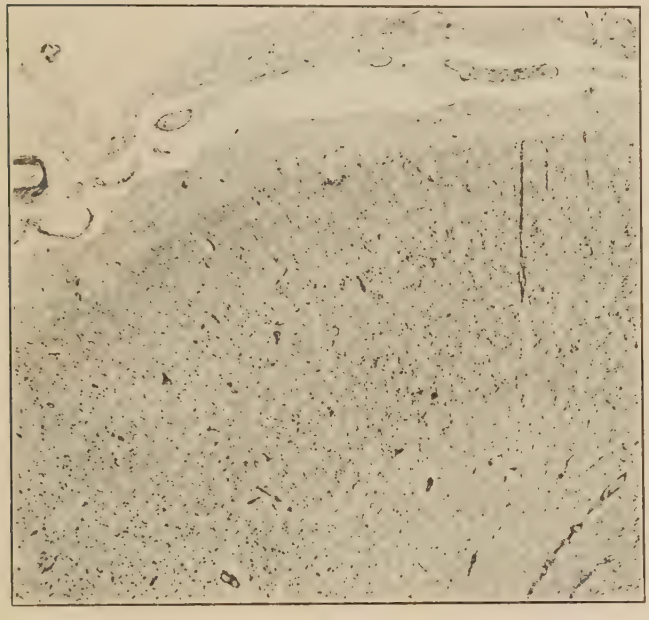

FIG. 1.—Case 1: Frontal region showing mild inflammation in the meninges and cortex, and distortion of cortical architecture. Nissl stain. × 22.

FIG. 2.—Case 1: Precentral cortex showing almost no inflammation but a diffuse loss of nerve cells. Nissl stain. × 26.

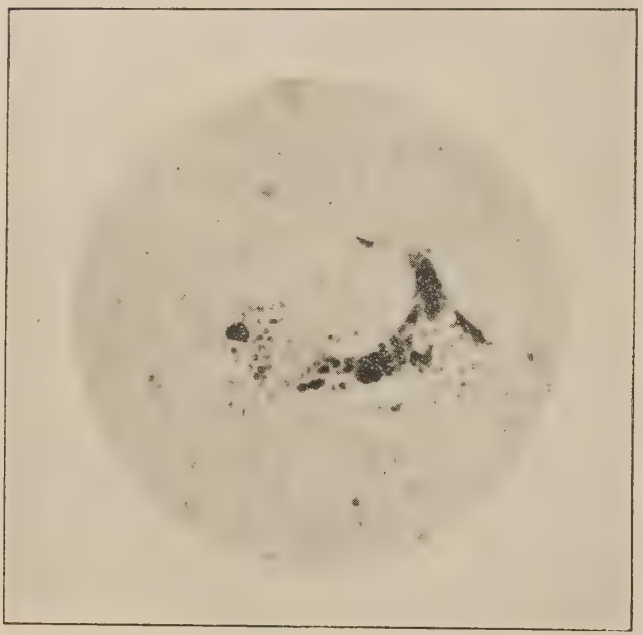

FIG. 3.—Case 1 : Positive iron reaction around a vessel of the frontal cortex. Turnbull stain. × 400.

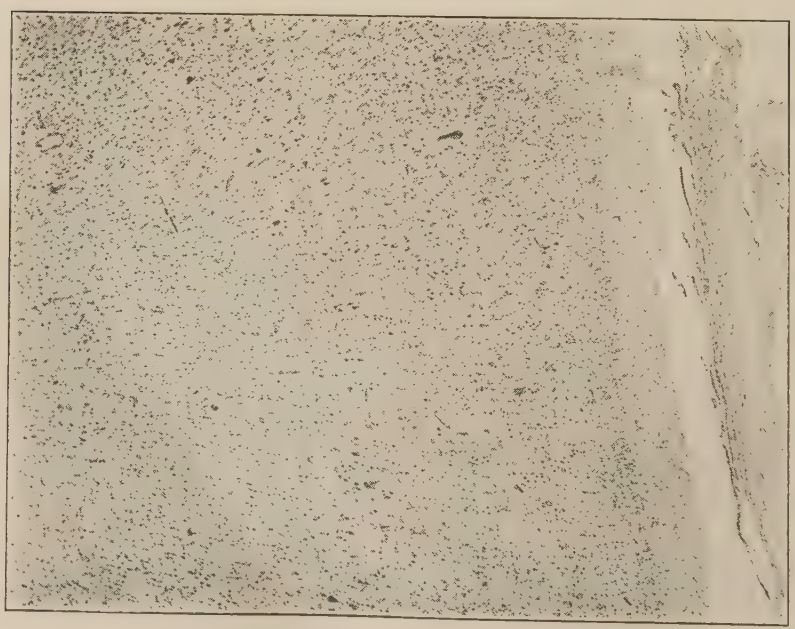

FIG. 4.—Case 2 : Precentral cortex displaying almost no infiltration, but a disturbance of cytoarchitecture. The meninges are thickened and mildly infiltrated. Nissl stain. × 26.

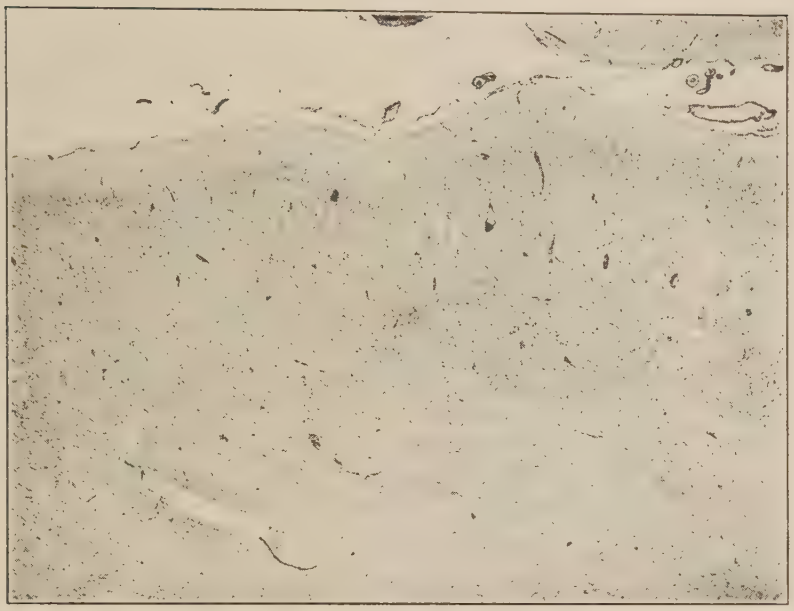

FIG. 5.—Case 2: Frontal cortex showing moderate perivascular cuffing and diffuse loss of nerve cells. Nissl stain. × 20.

FIG. 6.—Case 4: Occipital region showing heavy infiltration, more severe in the white matter than in the cortex. Nissl stain. × 19.

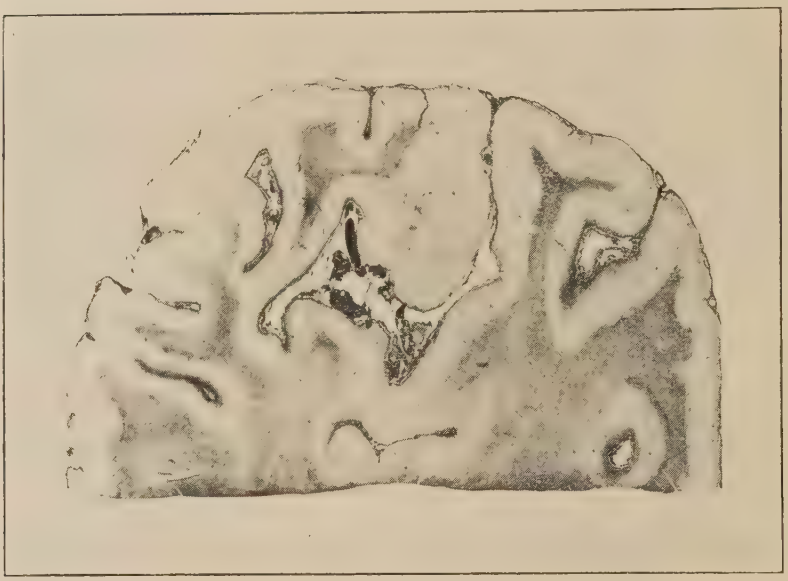

FIG. 7.—Case 4 : Intense fibrous gliosis in the white matter of the occipital lobe. Holzer stain. × 2·8.

FIG. 8.—Case 4 : Temporal region showing gross laminar necrosis of the third layer. Nissl stain. × 8.

a positive W.R., 30 cells per c.mm., and a total protein of 40 mgm. per 100 c.c. Between 1934 and 1946 he was treated with arsenical and bismuth preparations.

On admission he was in a state of profound dementia. He lay curled up in bed, made champing noises with his teeth, chewed at the bed-clothes, and was completely inaccessible and resistive to attention. Neurological examination revealed continuous lateral nystagmus and complete blindness. There were contractures of the lower limb with absent tendon reflexes. The upper limb reflexes were sluggish, the plantar reflexes extensor. The Wassermann reaction of the blood was positive at a dilution of 1 in 8. The cerebrospinal fluid contained three small lymphocytes, and 65 mgm. of total protein per 100 c.c.; its Wassermann reaction was doubtful; the colloidal gold curve was 5555531100. The diagnosis of juvenile general paralysis was made.

Commencing on 8 June, 1946, 50,000 units of penicillin were given intramuscularly every four hours, up to a total of 2,400,000 units. During and after treatment no improvement was apparent. He gradually deteriorated further, both mentally and physically, and died on 13 August, 1946, 66 days from the start of treatment. Cerebrospinal fluid removed after death gave a paretic gold reaction, but owing to contamination with blood the cell count and the protein estimations were not done; its Wassermann reaction was doubtful.

A post-mortem examination revealed no noteworthy changes in any organ except the brain. It weighed only 1,020 gm., but exhibited no circumscribed atrophy of convolutions. The pia showed considerable opacity and venous congestion in all regions. The basal arteries appeared normal.

Histological examination of the brain.—The regions most severely involved by inflammatory changes were the occipital and temporal lobes. Frontal and central cortex and striate body were distinctly less affected, and globus pallidus, thalamus, brain stem and cerebellum were only moderately involved. The meninges over the convexity were very densely infiltrated with plasma cells and lymphocytes. In the occipital lobe the perivascular infiltration was uniform, very severe, and predominated in the white matter (Fig. 6). High magnification revealed that the infiltration consisted mainly of plasma cells. In Weigert-Pal preparations a fine mottled demyelination was apparent in the white matter of this region. Holzer preparations revealed intense fibrous gliosis in the white matter (Fig. 7). There was no conspicuous outfall of nerve cells, but the cortical stratification was much deranged. In the other regions of the brain the white matter was only very moderately involved, and the inflammatory changes predominated in the cortex. In the temporal lobe there was gross laminar necrosis of the third layer (Fig. 8), extending in some parts to the second and, to a lesser extent, the fourth layers. In the third layer there was conspicuous glial proliferation consisting chiefly of hypertrophic astrocytes and microglial cells. The nerve cells of all layers displayed unspecific cell changes and much disorganization. Some of the remaining nerve cells of the third layer showed a picture very close to "ischaemic cell change." Occasional areas of focal outfall in the third layer occurred also in the central and frontal cortex. The microglial cells were hypertrophic and intensely proliferated throughout the cortex, and also in the white matter of the occipital region. This proliferation was considerably more severe than in any of the preceding cases. The iron reaction was strongly positive in microglia as well as in adventitia in all parts of the brain, including brain stem and cerebellum. In the occipital lobe iron deposits predominated in the adventitial cells of the vessels of the white matter. Other changes encountered were subependymal proliferation of the glia in the fourth ventricle and some marginal gliosis in the cerebellum. No spirochaetes could be found after careful search of several sections from the frontal, temporal and occipital lobes.

Discussion.

The optimum dosage of penicillin in the treatment of G.P.I. has not yet been established, but the total amounts used in our cases would certainly be regarded, according to the latest views (Worster-Drought, 1947; Rose and Solomon, 1947), as insufficient. Again, in such a chronic process as G.P.I. no reliable assessment of a new treatment can be made without a follow-up

study of many years. It is obvious, therefore, that no final conclusions regarding the merits of penicillin therapy can be drawn from this small number of cases, so limited in their dosage and in their duration of post-therapeutic survival. Nevertheless, the two improved cases, at least, provide interesting comparison with malaria-treated cases.

There is general agreement that in cases arrested by malaria, as evidenced by clinical stabilization and the return of the spinal fluid towards normal, there is histopathologically little or no evidence of inflammation, the extent of cortical damage depending on the stage at which the illness was treated (Wilson, 1928 ; Jahnel, 1930 ; Stern, 1932 ; Galbraith, 1938 ; and Stengel, 1945). The moderate degree of infiltration found in our two clinically improved cases (1 and 2) is distinctly below the average for untreated G.P.I., and is, indeed, very comparable to the state of affairs found after successful malarial treatment. The two clinically and pathologically unimproved cases (3 and 4) were both of a juvenile G.P.I. type of long standing, with a prognosis equally poor with malaria therapy. In Case 4 the prominence of focal symptoms in the clinical history, the severe involvement of the cortex and white matter of the occipital lobe and the laminar necrosis in the temporal cortex all suggest that this was probably a case of the Lissauer type. It bears some resemblance to the one reported by Galbraith and Meyer (1942), and, as these workers pointed out, the absence of epileptic convulsions and of macroscopic atrophy does not necessarily exclude such a diagnosis.

In Cases 1 and 2 there was a fairly clear correlation between the clinical and the pathological improvement, and also the decline of cell and protein contents in the C.S.F. This is in good accord with the fact that after penicillin treatment the most striking improvement in the C.S.F. has been found to occur in the cell-count and the protein content (Gammon, 1945 ; Stokes, 1945, 1946 ; Rose and Solomon, 1947). Rose and Solomon in their careful follow-up of 100 cases showed that in the majority the cell count returned to normal during the first 3 to 6 months, while the protein content took from 6 to 9 months to return to normal. The colloidal gold and Wassermann reactions improve more slowly in a smaller percentage of cases (Smith, 1947 ; Rose and Solomon, 1947).

The fact that, in spite of careful search, no spirochaetes were found in any of our cases, although by no means conclusive, is probably significant. In untreated cases, when the silver impregnation method is used, spirochaetes are found in 62·5 per cent. of cases (Grant and Kirkland, 1927). After malaria treatment it is very difficult to find any. In Wilson's (1928) series of 38 cases they were present in 6, 5 of whom had died during a period of clinical recrudescence ; in all of them the inflammatory changes were very severe. Stern (1932) in 24 brains of malaria-treated paretics was able to find spirochaetes only in 2. (See also Jahnel, 1930.)

As regards the iron reaction, although not very marked in Cases 1 and 2, it was on the whole indistinguishable from the findings in untreated cases of G.P.I. According to Wilson (1928), this reaction persists following malarial therapy, although it is perhaps somewhat decreased ; it may even undergo a later period of exacerbation, but other workers (Galbraith, 1938 ; Stengel,

1945) have demonstrated its disappearance in patients who had died long after successful malarial treatment.

The possibility of penicillin producing an initial exacerbation of the inflammatory process, as has been recorded in malarial therapy (Straussler and Koskinas, 1923, 1925; Gurewitsch, 1926; Freeman, 1927; Wilson, 1928; and Galbraith, 1938), is raised by Cases 3 and 4, whose clinical course was certainly not retarded.

The exacerbation of mental symptoms seen on the eighth day of treatment in Case 1 is reminiscent of a similar temporary relapse accompanied by fever and confusion in one of a non-fatal series reported by one of us (Smith, 1947), and was presumably a Herxheimer reaction. It seems unlikely that it could have been due to the irritative action of penicillin, for this has not been reported except following intrathecal injections (Walker and Johnson, 1945; Russell and Beck, 1945). No C.S.F. examination was, however, carried out during the episode. The Herxheimer reaction is associated usually with a temporary increase of lymphocytes (Rose, 1945), whereas the irritative effect is accompanied by a great number of polymorphs (Bittencourt and Canelas, 1945).

Summary.

Four cases are reported of general paretics who died some weeks after parenteral penicillin treatment (total dosage: 2,400,000 to 4,800,000 units).

Two of the cases had improved clinically as well as serologically. Histological examination of the brain of these two cases revealed inflammatory changes which were distinctly less intense than in the average untreated general paretic. The iron reaction was positive in all cases, but least intense in Cases 1 and 2. No spirochaetes were found in any of the four brains. These findings closely resemble the state of affairs found at comparable times after treatment of G.P.I. with malaria.

The two clinically unimproved cases were of the juvenile type of G.P.I., one of them a Lissauer type. They deteriorated rapidly following treatment, and showed no mitigation of the inflammatory reaction.

In one case at least there was a Herxheimer-like reaction.

The two improved cases suggest that treatment by penicillin alone is capable of influencing the pathological progress of general paresis.

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SOME OBSERVATIONS ON THE ANALYTICAL GROUP TREATMENT OF A PHOBIC PATIENT.

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Introduction.

The therapeutic factors operative in group treatment are still partially controversial, and further investigations are necessary to clarify their nature, mode of action, and range of curative potency.

In this paper the response of an individual patient to group treatment is examined in detail to gain further evidence of therapeutic group dynamics.

The technique employed was mainly analytical, and seems to have been similar in its main aspects to the group practices described by Foulkes (1944, 1946) and Ackerman (1943, 1946). The group consisted of 7–9 male patients, who met once a week for 1½ hours in an out-patient clinic. The patients had been treated individually for varying times prior to their admission to the group, but they had no individual sessions during their course of group attendance.

The author took shorthand notes during the group meetings, to have an approximate record of the contributions by the various patients. He avoided taking the lead in discussions, or giving lectures on psychopathology. He took, however, a hand in guiding the conversation and in clarifying those problems of motivation which had been considered or exhibited by the group. Individual interpretations or directives were only rarely given, and they chiefly took the form of applying a discussed problem to the particular circumstances of one or the other patient.

The patient whose case will be presented has been selected for the purpose because his group response was in significant contrast to his reaction to individual treatment and manifested certain therapeutic factors with unusual clarity.

Individual Treatment.

Mr. Tenn was 38 when he came to the out-patient clinic for treatment. He was seen in 19 individual interviews at weekly intervals.

He had been brought up in a puritanical and religious household. Up to the time of his marriage at 26 he had felt timid and shy in female company, and had therefore avoided it. He used to spend his holidays with male friends, and it was on the return journey from his last holiday as a bachelor that he first experienced anxiety and nausea during a long bus ride. This marked the beginning of a travel phobia which was originally restricted to holiday trips. In the course of three years the phobia spread; anxiety symptoms occurred even on short everyday journeys and he felt panicky in enclosed crowded places. He was forced to restrict

his social life, to give up his functions as an elder of his church, and had been unable to attend a religious service for over ten years. He was handicapped in his occupation, which necessitated a fair deal of travelling. He had received various forms of medical treatment for supposed cardiac illness and hyperthyroidism.

For many years he had been tormented by " rotten thoughts," which he tried to suppress by deliberate efforts to recall religious themes and Bible texts. These rotten thoughts consisted chiefly in fantasies of a " dream wife " with three girl children. He imagined perverse sexual practices with these children or with other adolescent girls whom he happened to meet in the streets. He would think of undressing them, of beating their naked bodies, and finally of having sexual relations with them.

His masturbation in adolescence had occasionally included practices of anal stimulation about which he felt particularly guilty. In this respect he recalled that, as an infant, he had been given soap suppositories by his mother, and these had been pleasurable experiences. He had also felt a certain amount of pleasure when his buttocks were smacked as a child.

His paternal grandmother had suffered from a temporary melancholic illness in old age. There was no other family history of mental abnormality. His father, who was still living, was a very religious man and had been a strict disciplinarian. He had often beaten the patient, even to the point of bruising his face. His mother, about whom the patient had little to say, died of a breast cancer when he was 11. There was an older brother and three younger sisters in the family, and these siblings were described as slightly nervous. His sisters had also received frequent beatings from the father, but the patient felt that the father had shown more affection for them than for him. He was vaguely aware that there might be an association between his fantasies of beating adolescent girls and his father's attitude to his younger sisters.

He had been a timid child, afraid of criticism and ridicule. As a boy he had sung in a church choir, but had to give it up because of stage fright.

His occupational career had been successful. He was a conscientious worker and had always been very careful with his money. He was inclined to be argumentative, and could not tolerate making mistakes or being in the wrong.

He was married and had two children (a boy of 11 and a girl of 8). In dealing with his children he tried to avoid imitating the over-strict attitude of his own father, but was aware that he often failed.

During the course of his individual treatment Tenn was eager to unburden himself and to confess his guilt-charged fantasies. He derived some relief from the feeling that his confessions were accepted with tolerance and understanding, but his symptoms remained unaltered.

Group Treatment.

After four months of individual treatment he joined a therapy group which was being formed at the time, and remained a regular member of it for about 14 months. He was always very punctual in his attendance, and only missed occasional group meetings through illness or during his holidays.

His attitude to the group was at first reluctant and defensive. He invariably waited for other members to introduce topics of discussion. When he joined in the conversation he remained hesitant and laconic. At the eighth group meeting he stated frankly that he had preferred individual treatment and had derived more benefit from it. He added, however, " Perhaps both forms of treatment should be combined."

Nine weeks later he had developed a more positive attitude to the group. He looked forward to the meetings from them on and declared that they had improved his condition in some ways. He had become more tolerant towards other people and less argumentative.

After eight months of group treatment he formulated his feelings in these words : " We meet on common ground here. If you talk to an outsider, they have no feeling for your complaints. Here we can talk freely to fellow-sufferers."

But even at that time Tenn had not been able yet to reveal his anal-sadistic tendencies to the group except for a guarded intimation of them at the seventh meeting. During that meeting a member mentioned his mixed feelings of pleasure

and fear on seeing horses beaten. Tenn responded to this clue and related, with marked anxiety, that he had a fantasy of being married to a dream wife with girl children and that he had pleasurable thoughts of beating them. He gave no further details and replied evasively to questions. His remarks gave rise to a short general discussion on sadism in which Tenn took no part. Another member then admitted indulging in masochistic thoughts, and put the question to each member in turn whether they had " active or passive " sexual fantasies. Tenn's brief reply was: " 75 per cent. active and 25 per cent. passive."

When other sexual topics, such as masturbation, were considered by the group, Tenn offered only sketchy and diffident contributions. He excused this by saying that sex had been a prohibited subject in his youth, and it had always been difficult for him to talk about it.

He was obviously inhibited in his communications to the group by a dread of social censure. This social anxiety, it was soon learned, was not restricted to the group situation. His travel phobia was more intense when there was a possibility that people might notice his anxiety. He always tried to secure an empty compartment, and if this was not possible, he would either wait for another train or take great care not to get into any conversation. From time to time he even changed the station from which he travelled to his office every morning so that he could not become familiar with anybody.

He also mentioned that his earliest social anxieties had occurred in connection with church activities, first, when he was a choir boy, and later when he took Sunday School classes. It was the dread of a punishing God which debarred him from going to church. It also prevented him from visiting cinemas, as the atmosphere there reminded him of a church, and the light coming from the projector was to him a menacing " unseen but all-seeing eye."

Group discussions brought to light that Tenn also harboured fears of being physically handicapped, due to " guilty acts." He felt his body was abnormally lean, and he was so self-conscious about it that he had never been able to go swimming, nor had he weighed himself for years. On one occasion, when two members with some knowledge of popular psychoanalytical literature mooted the question of " castration fears " and expressed their doubts about the meaning and value of this concept, Tenn remarked that such fears might be present in some people who had been threatened by their parents that their penis might fall off if they " touched themselves." This was a general remark with no personal reference, and it was only months later that Tenn admitted that he had attributed his leanness to acts of masturbation. At that time he also disclosed a fear that his penis was " not strong " because of these sexual practices in his youth.

After five months of group treatment Tenn was stirred up by a discussion to admit some sexual peccadillos of his childhood. Another patient had related an incident which Tenn regarded as an example of sexual curiosity in a child. He had also been curious about sexual matters when he was young and had felt very guilty about it. In the course of the subsequent debate he posed the general question how a child would react if it acquired knowledge of parental intercourse. There were several contradictory replies, but Tenn did not indicate his own opinion. At the next group session he volunteered information about an incident of his childhood which he characterized as due to sexual curiosity. He had passed water in front of one of his sisters and had been severely punished by his parents when they learned about it.

On several occasions Tenn spoke of his attitude to his father. He had feared, despised and disliked him, and he could not help being afraid of him still. He had been jealous of the father's affection for his sisters, and he had felt guilty in consequence. He had never been conscious of a similar hostility to his mother. In these and similar discussions it was apparent that he gained some understanding of the parental role in the development of personal standards of morality and the emergence of guilt feelings.

In his overt attitude to the therapist hardly any signs of resentment or hostility were noticeable until the 30th meeting (after eight months of group treatment). He then joined, for the first time, in criticism levelled against the therapist, and revealed that he had repeatedly been annoyed by the latter's avoidance of direct replies to questions and refusal to give advice in practical matters. He had also felt that the therapist showed preference to certain members of the group.

At the following meeting Tenn took the lead by advocating greater honesty in disclosing embarrassing thoughts, and particularly fantasies of a sexual nature. "We have made an attempt once or twice, but it was either towards the end of a meeting or the subject got brushed aside. We must bring out what we feel shy of." He followed this up presently by the first group confession of his desire for anal stimulation. "When I have intercourse there is a feeling in the back passage that something should be pushed up and down there." In his adolescence he had once, behind a bush, relieved his bowels in the presence of a girl cousin and had experienced an erection at the time. He also mentioned that his mother had applied soap suppositories when he was about three, and that this had caused pleasant sensations. When he got older he wanted to do this to one of his sisters. He felt very ashamed about these desires.

This confession aroused surprise and disbelief in other members. It certainly would be an unpleasant experience to have an object inserted into one's rectum. Tenn was uneasy, but reiterated that he would find it pleasant. He was relieved when the patient X— came to his support, who had also noticed agreeable sensation after suppositories and enemas. X— asked the group whether they had never experienced a pleasant feeling of relief when they had a bowel motion after a period of constipation. This was admitted, but, unlike Tenn, they had never had such feelings when they were sexually stimulated. The problem then arose whether such rectal sensations had any association with sexual feelings. Tenn and the other patient were inclined to affirm this; they had both frequently noticed a tendency to have an erection during defaecation.

After this meeting Tenn felt better for a time and began to lose his anxiety in cinemas. His travel phobia remained, however, unchanged.

A month later Tenn was able to unburden himself further. He gave a full account of his sexual and sadistic fantasies about adolescent girls. Recently he had also dreamt of having sexual relations with a little girl friend of his young daughter. The dream had been so vivid that he had an emission. He felt wicked and evil for having these fantasies, and was afraid he might one day put his sadistic thoughts into action. He was unable to account for these desires. "I had three sisters—all younger than me. That may perhaps explain it." The fantasies started when he was 17. He had then deliberately indulged in them to relieve his anxiety when meeting people in authority. Towards the end of the discussion the therapist pointed out that the bodies of adolescent girls are boyish in certain respects, and that the combination of immature feminine and masculine features might be particularly attractive to certain persons. Tenn admitted the feasibility of this suggestion.

At the next meeting this last point was again taken up and led to a consideration of non-sexual friendships between men. This discussion referred, however, mainly to a close friendship that had sprung up between X— and another patient. Tenn had found no fellow-sufferer with regard to his sadistic leanings. He even learned that he had been the subject of some derisive remarks made by one of the participants, who was frequently aggressive and tactless. When this was mentioned, the other patients were anxious to show their disapproval of such insulting rudeness, and to reassure Tenn of their sympathy and respect. They knew from personal experience how painful and embarrassing it was to reveal such intimate thoughts, as Tenn had done. Surely he felt better after getting "things off his chest." But Tenn was hurt: "You don't want another person to think he is a dirty-minded swine."

Tenn's beating fantasies increased during the following weeks. He was tormented by them day and night, and became irritable and dispirited. It took seven weeks before further significant material was elicited from him. Another member mentioned a childhood episode when he had felt sexually stimulated on handling his mother's underclothing. This incident had been related before, when Tenn had shown no apparent interest in it. This time, however, he responded: "Curious you should mention this. It came back to me just then—when I was 10 and my mother was ill, she asked me to get some knickers for her. I went and fetched them from her bedroom. It was the first time that I realized women wore such things. I knew my sisters did, but I had no idea what my mother was wearing."

The therapist gave an individual interpretation at this point, although there had been no general group interest in this subject. He suggested that Tenn's

desire to undress young girls may possibly have originated in an earlier desire to know what his mother looked like undressed. This interpretation was seemingly ill-timed; Tenn had no opportunity to register his response, as the discussion moved on, and it was later learned from him that he had completely forgotten that this interpretation had ever been made.

At the following meeting Tenn reported that he had felt "immensely better since last week." He had even managed to go to church on the previous Sunday without feeling very uneasy. But his sadistic thoughts were as troublesome as ever.

A week later a casual remark by Tenn revealed that his attitude to his father had undergone a fundamental change. Whereas he had previously thought of his father as particularly harsh to him, he now asserted that the father had been stricter to his brother and sisters than to him.

At this stage of his treatment Tenn began to experience a temporary mitigation of his travel fears. One day, when he was alone in a railway compartment, he felt so well that the thought occurred to him he would like to travel for hundreds of miles like that—a thought which would have frightened him previously. This improvement was, however, short-lived and, furthermore, he had never lost his anxiety of crowded compartments. He wondered whether the presence of people intensified his symptoms, because he somehow had the feeling they would condemn him for his sadistic fantasies, which continued to worry him constantly.

At the 51st meeting the topic of homosexual feelings was introduced by the therapist after X— had reported how upset he had been over a temporary illness of his friend. Tenn remarked that homosexual feelings seemed to exist frequently among schoolboys. An older boy would often make a great fuss of a younger one. When questioned about this statement, he added that this was done "in a kind of fatherly attitude."

X— refuted that any such feelings could be attributed to him; homosexuality had always revolted him. But after some discussion he stated that he had recently been "trying to imagine what it must be like for a woman to receive advances from a man." This prompted Tenn to the confession: "I have often wished to be a female during intercourse, and the woman should do the work."

During the subsequent weeks Tenn reviewed again his relationship to his father, and gave evidence that he had gained an objective and realistic understanding of the latter's influence on his character development. It had made him strive for an unattainable ideal of perfection, impatient with his own shortcomings, and oversensitive to criticism. He had now learned to be more tolerant with himself and others. At the same time it became noticeable that his behaviour in the group frequently exhibited an air of paternal benevolence to younger members.

At the 55th meeting Tenn reported that his anxiety in crowds was showing signs of abating. He had been to a dance and even to a basement teashop without undue discomfort.

At the following session he announced that lately he had not been troubled by sadistic fantasies; masochistic urges had, however, taken their place. His desire was now to undress in front of a woman and to be beaten by her. The group was puzzled by this new symptom. How could it be pleasurable to be beaten, even if it was only in imagination? The word perversion was mentioned, and Tenn turned to the therapist to be reassured that he was no pervert. A brief explanation of the difference between perversion and neurosis relieved his evident embarrassment. He then asked whether these new urges were connected with his interest in anal pleasures, and was given some information of the connection between anal desires and tendencies to hurt other people or to be hurt by them. It was emphasized that such tendencies were not at all uncommon. Tenn concluded this episode with the statement: "I am sure other people also have the urge to hit someone or to be hit. Only in their case it may take other forms. Why does a person nag, for instance? Because they like to cause distress to another person. They have not got a stick, but it is the same." He never mentioned his masochistic urges again in the group.

The next week he declared that he was feeling so well that he would like to terminate his group treatment gradually by only attending at fortnightly intervals in future. He was present at four more sessions at intervals of up to seven weeks.

At the end of his group treatment his fear of crowds and of company had com-

pletely disappeared. He now enjoyed going out and meeting people. He had even started to play the church organ again at children's services. On one occasion he had given a lecture in a closed and packed room and had felt no discomfort.

His travel fears had not responded so satisfactorily. He told the group: "I can stand the usual journeys now, but I don't like journeys to an unknown place. Even then I have not got the terrific panic I used to have, when you feel you have to smash the window to get out. I don't run up and down the train now to see if I can find an empty compartment. I just get into the first one, whether it is empty or not. But I still shirk long journeys." He was, however, unable to go by train to the seaside place which he chose for his next holiday, and had to cycle there. But he enjoyed, for the first time in his life, lying on the beach in bathing trunks. He was no longer self-conscious of his body, and even had a desire to be completely undressed. On his way home he travelled part of the way by train and felt no discomfort.

At the last group meeting he attended he also asserted that he was no longer tormented by his fantasies, but this statement was only partially correct, as the therapist learned in subsequent individual interviews. He continued to have sexual fantasies which were mostly of a masochistic nature; they neither caused him intense guilt feelings, nor did they prevent him from associating freely with young girls.

Comments on Psychopathology.

In the psychosexual constitution of this patient sado-masochistic and anal-erotic drives were conspicuous, and some of them had remained relatively undistorted through repressive mechanisms or reaction formations.

His sadistic leanings were accentuated through identification with the sadistic personality of his father. They also served as a means of disguised satisfaction for erotic impulses, which were prevented from unrestricted conscious representation. Through empathy with the objects of his beating fantasies (who in his thoughts enjoyed the beating) he was enabled to gain a vicarious gratification of his masochistic and passive homo-erotic trends.

The sadistic-erotic desires were directed towards adolescent girls. The choice of these objects was overdetermined and revealed his fundamental bisexuality. In the first place they represented his younger sisters, whose castigation by the father had been welcomed by his jealousy; but they also had been objects of libidinal attraction with whom he had wished to indulge in sexual play, e.g. to apply suppositories or to pass water in front of them. There were also some indications that incestuous mother desires had been personified in these sadistic-erotic imaginations. On the other hand, the immature bodies of adolescent girls also tempted him through their boyish qualities. It was, however, noticeable that this homo-erotic aspect was relatively free from sadistic desires. He became aware of a friendly feeling of "fatherly" attraction to young boys without any desire to beat them. His homosexual leanings were, on the whole, passive and masochistic; they were strongly repressed, and he became only vaguely conscious of them in the course of treatment.

It seems that sadistic fantasies had to some extent served as a defence against the emergence of passive and masochistic impulses. These latter impulses gradually increased in strength as the treatment progressed, and eventually exceeded his sadistic inclinations. Passive-erotic trends were clearly linked with fantasies of female identification, and their anal-erotic

roots could be discerned in the desire for the rectal insertion of an object during intercourse or masturbation.

Of other libidinal impulses, the desire for sexual perception and the related urge to expose himself sexually had largely contributed to his motivational conflicts and anxieties. He recalled memories which pointed to his infantile wish for sexual seeing; his sadistic fantasies included an initial undressing ceremonial to lay bare the sexual region. He had also minutely inspected his wife's genital region on several occasions. He had been severely punished once for exhibiting his penis to a younger sister, and in his later life anxiety dreams of appearing naked in the street were fairly frequent. In the group, he had great difficulty to overcome his fear of discussing sexual topics.

The repressive atmosphere of his early family life must be regarded as chiefly responsible for his failure to reach a mature genital level of psychosexual development. Fear of punishment and moral censure facilitated the regression to anal eroticism which predominated his adult personality. This regression was also conditioned by a hereditary predisposition from his father and by accidental experiences of anal pleasure in his childhood.

His superego development had resulted, through the influence of his disciplinarian father and his own sado-masochistic leanings, in an obsessionally strict character. His rigid moral code condemned the pregenital sexual impulses, of which he was aware, as evil and wicked. This self-condemnation was chiefly successful in isolating these impulses within the sphere of fantasy. The superego conflicts did, however, not remain entirely endopsychic; they were partially projected, so that situations which symbolized the threat of moral reprobation acquired a phobic quality. Significant changes of superego structure occurred in the course of treatment. The memory image of his father was transformed from a punishing and beating figure into that of a strict but benevolent person. Identification with this father image contributed to the weakening of sadistic fantasies and revealed itself in the paternal attitude of helpfulness which the patient adopted during the later stages of his group treatment.

The psychopathological structure of his symptoms, as far as it was revealed during treatment, reflected his conflicts over conscious and unconscious libidinal tensions in varying complexity. It appears that his avoidance of a church atmosphere and the associated fear of cinemas were mainly due to projections of religious superego threats. These symptoms were the first to disappear during group treatment.

His social fears appear to have been more complex in structure. Guilt feelings were only partially responsible for them. Much of his social anxiety was apparently aroused through the unconscious stimulation of repressed sexual desires, and particularly of passive, homosexual, and masochistic tendencies, in situations which necessitated close contact with strangers. When his occupation forced him to interview people in their homes he always refused an easy chair, but selected one which enabled him to sit upright and, if possible, to look down on the other person. His sadistic thought play had started in adolescence as a means to counteract passive fears in the face of authority. It also appears significant that these social anxieties increased in intensity

and range when, after his marriage, he had to abandon the company of his former male friends. Under treatment, these social symptoms disappeared only after he had become aware of some of his homo-erotic leanings and had accepted the passive-feminine-masochistic trends of his disposition. His sadistic fantasies then changed into overt masochistic desires. The symptom of stage fright which he had experienced in his youth indicates that a fear of exhibitionistic temptations also played a role in the complex etiology of his social anxieties.

His travel phobia seems to have contained elements of superego and social fears, but its etiological structure was not fully revealed during treatment. Certain aspects of this symptom remained resistant to group treatment.

Discussion.

Analytical group treatment achieved a partial success in this patient. The manifest results obtained were principally limited to alterations of two aspects of his neurosis—relief of social fears and acceptance of passive-masochistic trends.

These changes are intrinsically connected, and must be regarded as manifestations of a re-orientation of the personality through treatment.

It is proposed to discuss these results with reference to the therapeutic group factors involved and the general limitations of group treatment.

The correction of difficulties of social adjustment and of neurotic handicaps in interpersonal relationships is generally considered one of the chief assets of group treatment. Neuroses precipitated by a change in social environment, e.g. after recruitment into the armed forces or on resettlement in civilian life, have proved themselves especially amenable to group treatment. Beneficial results have also been obtained in patients in whom chronic social anxieties have existed without obvious environmental precipitation. Schilder (1939) remarked: "As one would suppose, group psychotherapy is especially effective in cases of what I should characterize as social neuroses. These are cases that do not feel comfortable in the presence of others. . . . The individual feels that he is the centre of attention, that not only is something wrong with him, but that others realize it. Every object becomes, in this respect, an important object on a sado-masochistic level. To be seen and to be observed means to be hurt and to be pushed into an inferior position." Of 12 cases of social neurosis he claimed 3 cured, 7 improved, and 2 unimproved. He also stated that many of his patients, and especially those with social neurosis, could not have been treated individually, even with the classical analysis. They reacted only in the group.

The therapeutic group factors operative in achieving these results are obviously complex and interrelated. Various aspects of them may be discerned in relation to the social fear syndrome of the present patient.

His fears contained an element of guilt which was consciously associated with his sadistic-erotic fantasies and other "guilty acts." An alleviation of such neurotic guilt feelings has been observed by all group therapists, and has been referred to such group factors as lessening of the fear of being different and abnormal, realization of the tolerant and sympathetic understanding of

the group members, strengthening of self-esteem through emotional support and acceptance, acquisition of an objective attitude to personal conflicts through theoretical discussions, and other similarly reassuring influences.

These group factors were also noticeable during the treatment of this patient. The relief of guilt feelings through such reassurance and emotional support had, however, only a partial and temporary effect on his social anxieties. Their main value seems to have existed in engendering an attitude of positive transference which prepared the ground for further therapeutic influences.

Among the repressed drives responsible for his social fears it was noticed that desires for sexual perception, exhibitionistic impulses, and masochistic, passive-homosexual tendencies played a leading role. What group factors were active in reducing the anxiety caused by the unconscious stimulation of these drives ?

Alexander (1946) stated that the basic therapeutic principle in all forms of analytical psychotherapy was an emotional readjustment which took place when the patient was re-exposed, under more favourable conditions, to conflict situations which he could not handle in the past. He termed this emotional readjustment " corrective emotional experience," and asserted that the acquisition of analytical insight was secondary to it in therapeutic importance.

It appears that the group setting constituted a conflict situation with regard to some of the repressed drives in the etiology of social fears in this case. The group task of self-revelation was a stimulus to his exhibitionism, and every disclosure of his sexual life which he anxiously made to the group was a corrective experience which mitigated his unconscious conflict about sexual exposure. The cathartic value of his confessions was partially due to this. It seems significant in this respect that his resistance against public confessions in the group was much greater than had been the case in the more private atmosphere of individual interviews.

Similar considerations hold true of his desire for sexual perception which, in the group, presented itself as a desire to hear the story of other members and to be instructed about the physiology and psychology of sex.

He never displayed any sado-masochistic leanings in the group ; he neither criticised or slandered other members, nor did his attitude invite attacks and ridicule by them. His passive sexual trends were, however, constantly stimulated, and his response to the group underwent subtle changes in the course of time which seemed to reflect a gradual correction of his fear that he might react openly to sexual overtures. At first he tried to avoid answering sexual questions, and showed great embarrassment on such occasions. Later he was able to follow the lead of others in discussing sexual topics of a personal nature. Towards the end of the treatment it frequently appeared as though his remarks were designed to prompt the group to probe his innuendoes of sexual self-disclosure.

All sexual discussions in this completely male group must also have been corrective experiences for the homo-erotic components of his libidinal constitution. It seems to have been more than a temporal coincidence that his sadistic fantasies and irrational social fears disappeared jointly after the 51st meeting, when homo-erotic and passive-feminine impulses were for once openly

discussed in connection with the close friendship that had developed between two other members.

The presence of homosexual stimulations in a male group setting has received relatively little attention in the literature. Ackerman (1946) mentioned "veiled flirtations of the homosexual type" in his groups of war veterans. The present writer (1947) had noticed these tendencies in groups which contained mild schizophrenic members. Similar observations were made by Dalberg* in out-patient groups of female neurotics. In this respect it may also deserve mentioning that in Schilder's report (1939) on his group therapy results he claimed to have cured a schizophrenic in whom "fear of homosexuality and homosexual ideas of reference had been in the foreground."

The value of providing substitutive gratifications for repressed exhibitionistic and homo-erotic drives is obviously not a characteristic peculiar to therapy groups. One is reminded here of the partiality for smutty stories, and the often frankly affectionate behaviour which is prevalent in the meetings of certain chronic alcoholics with a similar psychosexual constitution as the present patient, but a more accommodating superego. Their alcoholic meetings seem to constitute a group setting which has coincident therapeutic value.

The corrective emotional group experiences described cannot be regarded as transference phenomena in the narrow sense. They do not entail falsification of a reality situation through the emergence of emotions which are not adequate to the actual environment. The therapy groups must be considered in this respect as a social reality which can evoke homo-erotic and exhibitionistic responses in its members. Group treatment is in this sense more realistic than individual therapy. This may partially explain the greater intensity of emotional response which is observed in groups.

Insight is apparently not a necessary attribute of the therapeutic group effect. In the present case only partial insight was achieved.

Group treatment is generally regarded as a complement to individual therapy and not as a substitute for it. It has its special field of application as it "may utilize a segment of the psychodynamic and therapeutic spectrum which is not quite so readily engaged in individual treatment" (Klapman, 1946). From this it follows that its results have a different therapeutic range from those of individual psychotherapy. The limitations observed in the present case may, therefore, be an example of a general characteristic of all group treatment.

As has been pointed out, the social reality of a group setting favours certain emotional reactions, namely, those which are inherent in the situation and can, consequently, be repeatedly aroused and shared by other members. Individual transference reactions which have no echo in the general emotional atmosphere of the group are necessarily too evanescent to lead to corrective emotional experiences or to allow repeated analytical interpretations. Unconscious levels are, therefore, accessible through group treatment in a limited degree only. This fact has also been stressed by Foulkes and Lewis (1944), Slavson (1947), and Ackerman (1946).

* Personal communication.

The tentative conclusion may be drawn that the nature of corrective emotional experiences and consequently the range of therapeutic effectiveness is determined, apart from individual factors, firstly by the group setting as such, and secondly by the special circumstances of the group composition. Research with different groups, and particularly with groups of mixed sexes, or groups guided by both a male and female therapist, seems to be indicated to evaluate the therapeutic value of more extensive and varied corrective emotional experiences aroused by groups.

It might be contended that a longer course of group treatment might have produced further results. The patient, however, felt that he had gained the maximum benefit and it was his decision to terminate the group treatment. When individual treatment was offered to him some months later he was eager to accept it, although he knew that he could have re-joined the group at any time. The author is inclined to agree with the patient's own judgment that further attendance would not have added anything essential to the results already achieved.

Summary.

The effects of analytical group treatment in a phobic patient are described.

The psychosexual constitution of the patient and his response to the group were unusually transparent. He showed marked anal-erotic, sado-masochistic, and bi-sexual trends with repressed passive homo-erotic impulses.

The result of group treatment was mainly limited to a correction of irrational social fears through the reduction of guilt feelings and the gradual acceptance of his passive-feminine and masochistic leanings.

The therapeutic factors responsible for these results are discussed. The group is regarded as a social reality which can relieve guilt feelings through reassuring influences. More fundamental personality changes are produced through corrective emotional experiences. These are not transference phenomena in the narrow sense as they are adequate to the actual environment. The stimulation of exhibitionistic and homo-erotic drives in a completely male group is emphasized, and the therapeutic value of this stimulation is discussed with reference to the particular psychosexual constitution shown by the patient.

The therapeutic range of group psychotherapy seems to be determined, apart from individual factors, by the group setting as such, and the special circumstances of group composition. Research with groups of different compositions is suggested to widen the range of possible corrective emotional responses.

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PUPILLARY ABNORMALITIES IN SCHIZOPHRENIA AND DURING MUSCULAR EFFORT.

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The pupils of a normal subject are generally described as equal, reacting by constriction or dilatation to various stimuli. Inequality of the pupils as an isolated finding is said to be relatively common, but impairment of the light reflex, especially in conjunction with pupillary inequality, is held to be strongly indicative, if not pathognomonic, of organic disease of the nervous system. An exception is the "tonic pupil," for whose abnormally protracted reactions to light and accommodation an organic lesion has not yet been demonstrated. However, impairment of the light reflex is known to occur in subjects in whom there is no evidence of organic nervous disorder. These abnormalities of the light reflex have attracted little attention in this country, and are ignored almost entirely in text-books of neurology and psychiatry. Redlich (1908) made the important observation that muscular exertion might lead to dilatation of the pupil with impairment of the light reflex. Levine and Schilder (1942), in an extensive investigation of this phenomenon, concluded that muscular effort would produce dilatation and impairment of the light reflex in any pupil which initially retained its response to light, and would accentuate a pre-existing abnormality or bring out a latent tendency to impairment of the light reflex. Westphal (1907) first described the pupillary abnormality in catatonic schizophrenia to which the term "catatonic pupil" has been applied. This abnormality consists of pupillary dilatation with impairment of the light reflex, and is usually bilateral. The reactivity to light may vary from moment to moment, or from day to day; or pupillary rigidity may persist for a considerable time, with transient periods of brisk reactivity. Estimates of the frequency of the "catatonic pupil" vary remarkably—from 54 per cent. (Schilder and Parker, 1931) to 3·4 per cent. (Reichmann, 1913). Apparently a higher incidence has been found where repeated examinations have been carried out on the same subjects, but proper comparison is impossible, as the technique of examination has not been detailed by any of the authors.

Present Investigation.

343 male schizophrenics and 100 mentally normal males, all under the age of 55, were examined for pupillary inequality, after which a constant technique of examination was used to study the pupillary reactions to pain, light and muscular effort.

Technique of Examination.

Examination for pupillary inequality.—This was carried out in subdued light, at the shaded end of a room, with no direct light near the subject, and no "glare" from windows, walls or objects within the room. In practice this amounts to the minimum light intensity in which the pupil of a brown-eyed subject can be studied satisfactorily. Inequality was recorded as being present only if clear-cut.

The light reflex.—This was tested in subdued light, and in the dark when necessary, by suddenly switching on a 2·5 volt pocket flash-light held approximately 1·5 cm. in front of, and 1·5 cm. lateral to, the centre of the pupil, this being just medial to the outer canthus. With the flashlight in this position, and the subject looking straight ahead at a distant object, the effect of accommodation-convergence is eliminated, and any failure in co-operation can be detected easily. If co-operation was inadequate, the light was switched on with the beam directed away from the eye, and then suddenly directed at the pupil. The reaction of each pupil was tested at least three times on each occasion. Subjects were tested twice on separate days for inequality, and impairment of the light reflex; where abnormalities were found, the tests were repeated frequently during the following month.

The response to pain.—This was tested once in subdued light. A piece of surgical lint was placed over the side of the neck (this prevents the fingers from slipping) and a small fold of skin about two inches vertically below the mastoid process was pinched up through the material between the thumb and first two fingers; a firm, steady pinch was maintained for about two seconds, first on one side, and then on the other. If no dilatation at all was observed on testing and re-testing the result was recorded as negative, but the slightest dilatation was recorded as positive. Non-co-operative subjects were excluded.

The response to muscular effort and its effect on the light reflex.—These were studied once, in two stages, in subdued light.

(1) Mild exertion: The subject squeezes two fingers of an assistant as hard as possible with his right hand.

(2) Moderate exertion: The subject flexes his arm against strong resistance by an assistant.

Non-co-operative subjects were excluded.

Table I.—*Composition of Test Group.*

Schizophrenia (all types)	343
Simple	28
Hebephrenic	82
Catatonic	18
Paranoid	98
Paraphrenia	10
Schizophrenic dementia	93
Superimposed on congenital mental defect	14

Cases of chronic schizophrenia characterized by apathy, a tendency to negativism, occasional hallucinosis and infrequent incoherent speech have been classified as schizophrenic dementia.

Findings.

The percentage figures in the tables are worked out to two figures.

Table II.—*Incidence of Pupillary Inequality.*

Diagnosis.	Inequality (total incidence).		Inequality + abnormal light reflex.		Variable inequality alone.		Variable inequality + abnormal light reflex.		Constant inequality (alone).	
	No.	%.	No.	%.	No.	%.	No.	%.	No.	%.
Schizophrenia (343 subjects)	44	13	14	4·1	2	0·59	2	0·59	26	7·6
Controls (100 subjects)	20	20	1	1	—	—	—	—	19	19

Pupillary inequality is much more common in normal subjects than is generally recognized; the difference in incidence between the two groups is misleading, as approximately 30 per cent. of schizophrenic subjects did not co-operate fully. Only glaring abnormalities can be detected if the eyes are continually shifting around or partially concealed by frequent blinking, so it is highly probable that cases of mild inequality were not detected in non-co-operative subjects. The findings confirm the statement of Levine and Schilder (1942) that the "catatonic pupil" is characterized by variation in degree of inequality, as well as by variation in the reaction to light. Thus:

1. Although minor fluctuations in the degree of inequality were found in both groups, they were more common in schizophrenics.

2. Gross variation in the degree of pupillary inequality (i.e sometimes one pupil would be larger; sometimes the other) without abnormality of the light reflex was found in two schizophrenics.

3. Gross variations in pupillary inequality from day to day, with variable impairment of the light reflex, were found in two other schizophrenics.

Abnormalities of the Light Reflex.

It is generally recognized, although seldom taught, that in some subjects the response to successive flashes of light may vary, being poor one moment and good the next. This variation in response occurs more frequently in schizophrenics (10 per cent.) than in normal subjects (3 per cent.), and is often found in schizophrenics whose pupils show consistent impairment of the light reflex on other occasions. The impairment of the light reflex may be closely related to the "startle reaction." A sudden flash of light produces a definite "startle reaction," and it is frequently found that there is little contraction of the pupil in response to the first flash of light, but a brisk response to the second or third.

In resistive and unco-operative subjects considerable difficulty is encountered in judging the reaction to light, as the size of the pupil is continually changing, due to accommodation-convergence on different fixation points, and the effects of forceful deviation of the eyes. As many of these subjects roll the eyes up during examination, a study was made of the effects of strong upward gaze in 100 normal subjects.

Effect of strong upward gaze on the pupil:

*No effect	73
Pupil dilates	5
Pupil contracts	8
Size of pupil unchanged, light reflex sluggish	3
Pupil contracts, light reflex sluggish	4
,, ,, ,, ,, absent	7

It is clear that in resistive and unco-operative subjects an abnormal response to light may be of no pathological significance. Abnormalities of the light reflex, other than those described above, are shown in Tables III, IV and V.

TABLE III.—*Distribution of Abnormalities of the Light Reflex.*

Diagnosis.	Abnormal (total incidence).		Abnormal + inequality.		Abnormal alone.	
	No.	%	No.	%	No.	%
Schizophrenia (343 subjects)	53	15	14	4·1	39	11
Controls (100 subjects)	1	1	1	1	—	—

TABLE IV.—*Incidence of Abnormality of the Light Reflex in Different Mental Disorders.*

Diagnosis.	Number of cases.	Number abnormal.	% abnormal.
Simple schizophrenia	28	4	14
Hebephrenic schizophrenia	82	14	17
Catatonic schizophrenia	18	2	17
Paranoid schizophrenia	98	9	9·2
Paraphrenia	10	2	20
Schizophrenic dementia	93	18	19
Schizophrenia superimposed on mental defect	14	4	24
Congenital mental defect	15	2	13
Controls	100	1	1

TABLE V.—*Analysis of Abnormalities of the Light Reflex.*

Type of abnormality.	Schizophrenia.		Controls.	
	No.	%	No.	%
Sluggish in subdued light only	44	13	1	1
Sluggish in subdued light and in the dark	1	0·29	—	—
Absent in subdued light, sluggish in the dark	5	1·5	—	—
Absent in subdued light and in the dark	3	0·87	—	—

* In many of these subjects the pupil constricted slightly at first, and then returned to its original size.

In drawing up the above tables the abnormality recorded for each case is the greatest abnormality observed in that subject. In only two cases was the abnormality constant during the period of observation.

The following abbreviations are used in case-histories :

L., left pupil ; R., right pupil ; >, greater than ; =, pupils equal ; fix., light reflex absent ; sl., light reflex sluggish.

The results of examinations on different days are separated by a colon, e.g. result of first examination : of the 2nd : of the 3rd : etc.]

Patient W. D—, aged 52, paranoid schizophrenic. Abnormality probably a minor variant of the tonic pupil. Reaction sluggish in subdued light ; adequate, but slower than normal, in the dark. Accommodation-convergence slow (about 5 seconds), and sustained. Tendon reflexes brisk.

Patient H. S—, aged 48, schizophrenic dementia. Fix. L.>fix. R. in light and dark. Accommodation-convergence fair. Tendon reflexes brisk.

In the other subjects the degree of abnormality varied from day to day, and was often asymmetrical.

Patient N. D—, aged 45, hebephrenic. Variable inequality and variable light reflex. R. sl.>L. : L.>R. sl. : R. sl. = L. sl. : L.>R. : R. sl.>L. sl. : L.>R. : R. sl.>L. sl. : L.>R. : R.>L. : R.>L. : R. = L.

In one patient variation during even shorter periods was observed.

Patient S. L—, aged 36, schizophrenia superimposed on congenital mental defect. 9.20 a.m., sl. L.>R. ; 9.22 a.m., sl. L.>R. ; 9.26 a.m., L.>R. ; 9.30 a.m., L.>R. ; 9.34 a.m., fix. L.>R. sl. ; 9.45 a.m., L. = R. ; 9.47 a.m., L. = R.

Syphilis could be excluded as a cause of the abnormalities in all except two cases ; it is improbable that neuro-syphilis existed in either of these.

TABLE VI.—*Pupillary Response to Pain.*

Diagnosis.	Number co-operating.	Positive %	Negative. %
Schizophrenia	211	66	34
Controls	100	83	17

These figures show diminished sensitivity of the pain reflex in schizophrenics.

Pupillary Reactions to Muscular Effort.

Results are recorded as follows :

— No change.
+ Dilatation.
++ Dilatation + sluggish light reflex.
+++ Dilatation + absent light reflex.

TABLE VII.—*Response to Mild Effort.*

Diagnosis.	Number co-operating.	−%.	+%.	++%.	+++%.
Schizophrenia	212	61	36	2·1	0·52
Controls	100	26	73	1	—

TABLE VIII.—*Response to Moderate Effort.*

Diagnosis.	Number co-operating.	−%.	+%.	++%.	+++%.
Schizophrenia	220	37	45	12	5·5
Controls	100	14	59	27	—

In the schizophrenic group a greater proportion showed no response to muscular effort. In a certain proportion the light reflex was lost altogether, this presumably being due to the bringing out of a latent abnormality. The results in normal subjects are consistent with previous observations that the dilatation and impairment of the light reflex are proportional to the degree of muscular effort (Schilder and Parker, 1931; Levine and Schilder, 1942), but only if the subject is completely relaxed before the test, and the command to carry out the muscular effort is given suddenly. If the subject is told, "I want you to squeeze hard when I count three. Quite relaxed please—one, two, three," the pupil can be seen to dilate on the command "one," and in favourable subjects it dilates by numbers to a maximum on the command "three." In many cases the dilatation on the command "three" is small compared with the initial dilatation. The initial dilatation is accompanied by a subjective sensation of "getting set," but the actual muscular tension developed is small in proportion to the pupillary dilatation.

The Pupillary Changes during Electro-convulsive Therapy (E.C.T.) and Insulin Coma Therapy.

Further study showed that muscular effort is accompanied by dilatation of the pupil and impairment of the light reflex, whatever the state of consciousness. Thus during insulin coma, dilatation of the pupil with diminution of the light reflex occurs always in association with some sort of motor activity, whatever the degree of consciousness—in sopor in association with motor restlessness and resistiveness, in coma with flexor and extensor spasms. This association is particularly noticeable during termination of a coma with intravenous dextrose, the onset of the pupillary changes coinciding with the sudden violent outburst of straining and restlessness that often occurs as consciousness returns. Similar changes occur during motor restlessness in the stage of nitrogen inhalation therapy before loss of consciousness (Levine and Schilder, 1942), and in the motor excitement that occasionally follows E.C.T. Dilatation of the pupil with loss of the light reflex also occurs during the tonic phase of the fit produced during E.C.T.; the pupil remains in this condition during the clonic phase, and returns to normal 5 to 60 seconds after the fit ceases. (In one case the light reflex returned towards the end of the clonic phase.) A "sub-convulsive" dose produces a short muscular spasm with dilatation of the pupil and impairment of the light reflex for a few seconds. The pupil then returns to normal. If a delayed fit occurs, the pupil may return to normal and then suddenly dilate and become fixed to light as the tonic phase comes on. These pupillary changes probably occur during all major epileptic fits, as they were also noted during a fit which occurred spontaneously in a patient

in insulin coma whilst I was actually studying his pupils. The resemblance to the " Redlich phenomenon " is striking—during a fit great muscular tension is accompanied by dilatation of the pupil with loss of the light reflex. The main difference between this and the changes during normal muscular effort lies in the state of consciousness of the subject, and in the degree of muscular tension developed. The pupillary changes during E.C.T. may be considered to be those of severe muscular effort in an unconscious subject.

Discussion.

The Etiology of the Pupillary Changes during Muscular Effort.

Previous discussion on this subject has been concerned with the question as to whether the changes are due to " psychic " causes, or to some special effect of the muscular tension itself. The most recent contribution is that of Levine and Schilder (1942). They concluded that muscular effort produces its effect by inhibition of the pupillo-constrictor centre, and that this inhibition is reflex, due to stimulation of the splanchnic nerves by the rise in intra-abdominal pressure accompanying the muscular effort.

Discussion as to the relative importance of psychic factors and muscular tension has the unfortunate effect of obscuring the two fundamental issues :

1. Are the effects due to nerve impulses directly from higher levels, or are they reflex, due to the muscular tension itself? (The effects occur without any latent period, and so cannot be due to adrenaline or metabolites released into the bloodstream.)

2. If the former alternative is correct, are the impulses from higher levels of psychic or of somatic origin, and what are the underlying physiological mechanisms ?

There is considerable evidence that muscular tension *per se* is not responsible for the pupillary changes. It has been mentioned above that the pupillary changes during E.C.T. may be considered to be those of severe muscular effort in an unconscious subject. A study was made of the pupillary changes in patients undergoing E.C.T., modified by the intravenous administration of curare in dosage sufficient to abolish all muscular contraction, except for almost imperceptible movements in the diaphragm and facial muscles. In these patients the pupillary changes were exactly the same as those during unmodified E.C.T. (curare alone had no effect on pupillary size or reaction to light). In other words, motor impulses from " higher centres " can cause pupillary changes in the absence of muscular tension. Also, as stated above, in conscious subjects pupillary changes may precede the actual muscular effort. It is clear that the hypothesis that the pupillary effects are due to raised intra-abdominal pressure is inadequate. The facts indicate that the pupillary changes during muscular effort are due to motor impulses from higher levels.

These impulses may be either psychic or somatic, or both, e.g. psychic factors predominate in producing the pupillary changes—

(1) Whilst " getting set " for voluntary effort.

(2) During the muscular tension associated with emotional stress.

Somatic factors predominate in producing the changes:

(1) During major epileptic fits.
(2) During flexor and extensor spasms in insulin coma.

Any suggestion as to the physiological mechanisms involved is purely speculative. It is usually stated that sympathetic stimulation causes dilatation of the pupil, without any effect on the light reflex. This is manifestly incorrect, as an active dilatation of the pupil must interfere with simultaneous contraction and so cause impairment of the light reflex. There is every reason to believe that the law of reciprocal innervation applies to the movements of the pupil, and that the pupillary effects are due to sympathetic stimulation in combination with simultaneous para-sympathetic inhibition. It is possible that simultaneous sympathetic stimulation and para-sympathetic inhibition are brought about as part of a generalized discharge from the hypothalamic autonomic centres. Thus a rise in blood-pressure, tachycardia, and pupillary dilatation occur during E.C.T. modified by curare, where the changes cannot be due to muscular tension. This autonomic discharge may be initiated by impulses from both cortical and infra-cortical levels, as pupillary changes accompany muscular spasms during the stages of insulin coma where cortical function is abolished (e.g. during flexor and extensor spasms).

Pupillary Abnormalities in Schizophrenia.

In schizophrenia there is a high incidence of diminished pupillary response to pain, light and muscular effort. Hyporeactivity to various other stimuli has been demonstrated in schizophrenics—to thyroid extract, insulin, dinitrophenol, vestibular stimulation and inhalation of hot moist oxygen (Mayer-Gross and Moore, 1944). From the psychobiological standpoint these findings may be correlated with the schizophrenic's lack of normal emotional response to the outside world. It is interesting to note that the term "withdrawal" has been applied to the psychological and physiological changes in schizophrenia (Mayer-Gross and Moore, 1944).

The abnormalities of the light reflex are of particular importance, as they may lead to confusion in the differential diagnosis of schizophrenia from neurosyphilis, and also in the diagnosis of neurological disorders appearing incidentally in known schizophrenics. The term "catatonic pupil," although appropriate, is misleading, as abnormalities occur in mental disorders other than catatonia. I have seen inconstant diminution of the light reflex in mental defectives, and in a subject suffering from simple depression, and it has also been described after epidemic encephalitis (Westphal, 1907), in psychoneurosis, alcoholic delirium, arteriosclerotic psychosis and neurosyphilis (Levine and Schilder, 1942). Moreover, abnormalities are just as common in other types of schizophrenia as in catatonia.

The cause of the pupillary changes is as uncertain as the cause of schizophrenia itself. Schilder and Parker (1931) advance a theory of multiple causation, postulating constitutional, toxic-organic, and psychic factors. There is no doubt that somatic factors, whether constitutional or acquired, play a

part in the production of the pupillary abnormalities, but not everyone will agree with Schilder and Parker in their emphasis of somatic constitutional factors. There is considerable evidence that emotional changes are important in the production of the pupillary abnormalities. In cases quoted by other authors, the relationship of the abnormality to emotional factors is clear-cut; for example, in Westphal's (1907) case of traumatic neurosis, which developed changes whenever the question of withdrawing compensation was raised, and in Levine and Schilder's (1942) patients immediately before nitrogen inhalation and metrazol convulsion therapy. The high incidence of abnormalities in schizophrenics may be correlated with their apprehension, suspicion and timidity, and with the severity of their emotional disturbance. In the present series a considerable proportion of the patients, whose pupils reacted poorly to light, showed gross manifestations of emotional disturbance during examination, and it has been pointed out above that variable impairment of the light reflex may be related to the "startle reaction." Schilder and Parker (1931) attributed the disproportionately high incidence of abnormalities in negro schizophrenics to somatic constitutional factors. It is equally plausible that the high incidence is attributable to emotional factors, as superstition, apprehension and resistiveness appear more commonly in the negro.

It may appear contradictory to stress emotional factors as the cause of the pupillary changes, and at the same time to correlate diminished reactivity to light with "withdrawal." However, "withdrawal" does not necessarily mean apathy—the world of unreality may be actively defended against outside interference. Interfering stimuli may be dealt with by ignoring them, but if a situation such as physical examination interferes with the world of unreality, it creates an emotional disturbance, and is resented and resisted. Thus the apprehension, suspicion, and resistiveness of the schizophrenic are directly related to withdrawal from reality.

There is a close connection between the Redlich phenomenon and the pupillary changes in mental disorders, inasmuch as psychic factors play a prominent part in both, and mental disorders are frequently accompanied by changes in muscular tension. It is possible that the same nervous pathways are involved in both cases. The following case is an excellent demonstration of the close relationship between emotion, muscular tension and pupillary abnormalities.

Patient K. G—, aged 26, paranoid schizophrenic. Actively hallucinated, aggressive, persecuted and pre-occupied with somatopsychic delusions. Routine examination—pupils normal, react well, dilate with muscular effort. He was taken out of the hospital by his relatives, and subsequently had to be brought back; when seen immediately after his return he was quiet—pupils normal. During conversation he developed hysterical tremors of the arms and legs, his comment being, "I need treatment—I've got to get out of here." These tremors could be brought on or terminated by suggestion, so that repeated study could be made of the pupillary changes during "attacks," the changes appearing to be proportional to the extent of the hysterical manifestations. With mild tremors of both arms there was no change in the pupils; with moderate tremors of arms and legs there was slight impairment of the reaction to light; and when severe movements were continually shaking the entire body there was marked impairment of the light reaction. The next day the pupillary reactions were normal.

Summary.

Abnormalities of the pupillary light reflex occur in schizophrenia, and are closely related to the pupillary changes during muscular effort, which are attributed to simultaneous sympathetic stimulation and para-sympathetic inhibition by motor impulses originating in the hypothalamus. Psychic factors are important in the production of the pupillary changes in mental disorders and during muscular effort, but these changes are not exclusively of psychic origin.

From a psychobiological point of view the abnormalities of the pupillary response to light, pain and muscular effort in schizophrenics can be correlated with their hyporeactivity to various other stimuli, and with their lack of normal physical and emotional response to the outside world.

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MODERN TRENDS IN THE PLANNING OF MENTAL HOSPITALS AND OTHER PSYCHIATRIC UNITS IN ENGLAND.*

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The mental hospital of to-day has developed in stages from the earliest of which we have any particulars.

Progress in planning and design has been gradual, with periods during which it has been pronounced. Each period has shown an advance in the lay-out and detailed arrangement of the buildings to meet the coincident advance in methods of care and treatment of the patients.

The very early buildings had no definite plan, were more like prisons than hospitals, and provided indifferent accommodation, comprising mainly cells, opening off passages of communication which yet provided practically the only day space. Patients were chained and locked in these cells by day and night and had little medical attention.

As more humane methods of treatment were adopted, the need for better accommodation was realized, more space was provided for day use, passages were wider and became day corridors or galleries, some with bay windows projecting at intervals, some with projecting day-rooms at the ends; dormitories—each for a few beds—were introduced; single rooms were improved and a general plan evolved, sometimes designated "the corridor plan," comprising the central block of administrative buildings, with patients' wards extending on each side—for male and female patients respectively—at right angles to the axis of the central block, or returned to form an open quadrangle, in some cases enclosed by other wards or by cross corridors at the back. Access to the outer wards from the centre was through the inner wards, and few of them were self-contained. A typical example of the later development of this type is Hereford Mental Hospital. As classification was introduced or improved, wards were allocated for various distinct groups of patients, first probably for the sick, then the infirm, the epileptics, the chronic workers and so on. Separation of the wards for these distinct classifications, planned as pavilions connected at ground floor level by a main corridor, became more general and produced the "corridor pavilion" plan. The arrangement varied with the plan of the corridors. In some cases these were on the lines of the capital letter **H**, with the administrative buildings on the cross bar of the **H** and the pavilions on the outer side as at Banstead, but, in later hospitals, the corridors spread diagonally from near the front of the administrative buildings,

* Read at the Annual Meeting of the Royal Medico-Psychological Association at Eastbourne on July 9, 1947.

with the pavilions on the southern or outer side. This plan, with variations, applied generally until 1914. A notable feature introduced during this period was the provision of a detached acute hospital—the forerunner of the present Admission Hospital and Early Treatment Centre—and of the detached villas for certain classifications. These detached villas were few in number at first, but increased in later examples. A typical example of this period is Long Grove, in which the corridors and covered ways form a broad **U** in plan. The wards are planned in echelon connected at the corners each having an access from the **U**. The detached units—hospital, convalescent, chronic and working patients' villas and the isolation hospital are suitably sited in relation to the main buildings.

The latest example of the type is West Park, also on the Horton estate, similarly planned, but with the wards unconnected, each having its access from the covered way and not from the adjoining ward. The wards, however, overlap, which spoils the aspect from some of the rooms of each ward and limits the area of the exercise gardens. The detached units again are suitably planned.

Many other hospitals deserve mention as illustrating the growing trends, but these cannot be dealt with in the limits of this paper. Mention, however, must be made of the Ewell Epileptic Colony, opened in 1904, which was planned on colony lines—a logical development of the detached units—continued in later extensions. This institution is now known as St. Ebba's Hospital, and is the first mental hospital in this country to be planned entirely on colony lines.

Modern trends in planning of English mental hospitals may be traced from the inter-war period of 1919–39, in which the Board's suggestions were revised, further developments were encouraged, and, in particular, the provision of Early Treatment Centres comprising an Admission Hospital and Convalescent Homes—with provision for future semi-convalescent Homes and Nerve Units;—of conjoint units for the sick, the senile and infirm, the noisy and disturbed —designated the closed units—and the adoption of the colony plan of detached units for all patients were recommended. This period also saw the development of Nursing Homes, of institutions for voluntary cases, of Out-patients' Clinics—though, in most cases, existing buildings were used or adapted for these purposes—and provision of many Mental Deficiency Colonies.

Of the new mental hospitals, Shenley Hospital for Middlesex shows a step in the current development. The administrative buildings are central as usual. Immediately opposite on the South is the Admission Hospital and two Convalescent Homes, not so distinctly separated as desirable. On each side of the official unit are the wards for sick and infirm and for quiet and harmless patients and, near the back of the administrative buildings, are units for the disturbed and excited for each sex. The remaining units are all on detached sites, on ring roadways giving ample space for separate gardens to each unit. Shenley Colony for mental defectives lies nearly a mile to the North of the mental hospital, and is planned, as all other mental deficiency colonies, with all units detached. The general lay-out follows the accepted plan, with its central group of administrative buildings and workshops—the latter of which are

much more extensive than at a mental hospital—and the arrangement of the patients' homes, well apart, around large open spaces and with homes for the lowest grade cot and chair cases sited away from the other homes.

The next hospital to be erected was Runwell Mental Hospital.

The lay-out is symmetrical. The administrative buildings are central, with the sick hospital for both sexes—completely detached—situated directly opposite on the South. On each side of the official block are units for epileptics, unemployables and the infirm; behind are wards for non-parole working patients, conveniently near the workshops at the rear. All these are enclosed within a roadway. To the North on each side are two parole wards with provision for a third, around open quadrangles as exercise gardens.

The Early Treatment Group is off the drive to the East, practically in its own grounds, where the patients and their visitors are away from the main buildings and out of contact with chronic patients.

The conjoint closed unit is in a corresponding position on the West, well detached from the main buildings. It includes a new feature—a special treatment centre and also occupational therapy rooms.

Barrow Gurney Hospital, near Bristol, departs very definitely from the orthodox; no attempt has been made to provide a symmetrical arrangement, but a well-balanced scheme has been designed. The entrance is from the North, the drive separating East and West at the church—enclosing the group of detached central administrative units. From the South end the road forms a large oval, the male units being sited on the West curve, the female on the East, a private patients' unit separating the two sections, and the interior of the oval providing the main recreation ground. The Early Treatment Centre is to the East of the official block secluded by woods; the conjoint unit is opposite to the West, also in a wood, and the sick hospital is to the East of the oval, approached by a branch road and also by a road from the Early Treatment Centre.

So far a portion only of the buildings has been erected, some of the patients' units being used temporarily for staff. The final scheme is for 1,150.

Two schemes were ready for erection, but deferred on the outbreak of war. Of these, the third mental hospital for Essex at Margaretting has a very attractive lay-out and provides for 1,200 patients. The site lies to the South of the main London-Chelmsford Road and is intersected by the L.N.E.R. The southern and larger portion was selected for the hospital buildings and the northern portion for the staff residences, planned on a model village lines.

On the left of the entrance drive at the South, near the lodge, are the Nurses' Home, the Matron's bungalow and the Early Treatment Centre. Opposite, East of the drive, is the group of parole villas for female patients, and well back from the drive is the conjoint sick hospital, with a private patients' unit beyond. The church occupies a prominent central position. The official block and administrative buildings are North of a cross main road separating the special units from the remainder, and at the East end of this road, concealed by a well-grown wood, is the conjoint unit for the disturbed and excited patients. On each side of the administrative buildings are the units for chronic patients with, at the end of the female group, a small separate

unit for disturbed and excited female patients unsuited for residence in a conjoint unit. At the N.E. corner, well detached, are the parole villas for male patients.

Lathom Park, the remaining hospital which is ready for erection, was the subject of an architectural competition, initiated by the Lancashire Mental Hospitals Board, for a new hospital of 1,000 beds and a new mental deficiency colony for 2,000 beds, on a very large site intersected by a cross road, dividing it into two areas, each of the appropriate size for one institution.

The scheme for the mental hospital is attractive. It is to a certain extent on symmetrical lines, with a vague resemblance to the orthodox pavilion plan of pre-1914—but with all units detached.

The official unit and administrative buildings are central. A ring road, oval in shape, is planned on each side, on the outer sides of which are units for senile and infirm, epileptic and parole patients, with the conjoint sick hospital centrally on the South. Inside the oval, on the South of a cross path, are the units for the undefined and working patients, near the workshops on the North of the path, and near the administrative centre for easy access of patients to the recreation hall, etc. The Early Treatment Centre is in the South-West corner of the estate, with a separate entrance drive from the public road on the West and an internal road from near the Sick Hospital. Diagonally opposite, to the North-West of the main group, is the conjoint unit for the disturbed and excited patients, screened by a wood. The staff houses are planned on model village lines around St. John's Church, an existing parish church.

One particularly notable innovation in detail is a cafeteria for use by patients who can be trusted to make proper use of this facility, situated under the central recreation hall and cinema.

Burscough Colony on the Northern portion of the estate is completely detached from the mental hospital, excepting that a central power plant is arranged at a suitable point on the cross road from which will radiate all the engineering services to both institutions.

The Colony is planned on typical lines, with its central group of administrative buildings ; patients' homes planned on the South side of ring roads ; the conjoint sick hospital and conjoint tuberculosis unit central to the North, and cot and chair homes grouped nearby, but at a sufficient distance. The Nurses' Home is near the lodge, the homes for senior officials are planned near the public road, and the other staff houses are included in the model village at St. John's Church.

A definite trend in the planning of these later schemes is that the architects worked in close co-operation with the Medical Adviser to the Committee. The advantages are obvious, and while this is not a new departure, it is fortunately being more frequently adopted. Where such collaboration is closest, there the best results are obtained. This was particularly evident at Margaretting, where Dr. Masefield was so closely concerned, and also at Lathom Park and Burscough, where Dr. Grant and Dr. Robertson respectively acted with the architects in the preparation of the final drawings for the two institutions.

It is desirable that this co-operation should extend even to minor schemes of alterations and additions, the Medical Adviser enumerating the needs and the architect showing how these can best be incorporated. It is a mistake to entrust such works to the Engineer, or Clerk of Works, as with few exceptions, neither of these officials has the architectural training to enable him fully to appreciate the architectural possibilities and to tender the best advice, as would be done by a properly trained architect, or more so—an important point—by an architect with special experience in mental hospital planning and administration.

The requirements for a mental hospital and the standards now adopted are fully described in the revised "Suggestions and Instructions" pamphlet, issued by the Board of Control. New suggestions are already coming to light. The desire to integrate the treatment of mental with physical illnesses and the correlation of mental and general hospitals for all purposes, including teaching, will bring forward many new problems, and further revision of the pamphlet is inevitable.

The site of the mental hospital of the future may be less remote than in the past, mainly for the convenience of the staff, of consultants, of students, of patients' friends, and also of parole patients who may be permitted to visit nearby towns, accompanied or unaccompanied. On the other hand, with the facilities of modern transport, the advantages of an open site in the country may outweigh these considerations.

The latest standards as to spacing of beds in the various units increase the minimum floor areas, but bed spacing must be the deciding factor. When this is applied to existing hospitals, a considerable reduction in the recognized accommodation of each will be inevitable. Further, the lack of balance of day and night space which prevails in many hospitals, owing to the allocation of day-rooms as dormitories to reduce overcrowding by night, will have to be rectified. Modernization of existing hospitals will be one of the problems to be tackled, and will include an opening out of wards to obtain better light and ventilation, improvement of single rooms, better sanitary arrangements with more space for ablutions, and the re-allocation of the accommodation to provide smaller and self-contained wards, *each, preferably, not exceeding* 40 *to* 50 *beds*, with all the features now regarded as essential. All these improvements will tend to a further reduction of the present recorded figures.

Regarding the planning of individual units, the main trends in all hospitals described and now applicable to new proposals are simplicity in planning and finish; arrangement of day rooms and of dormitories, with their single rooms, for easy supervision from a central point by the duty nurse; dormitories not exceeding 20 ft. in width for two rows of beds; more room in ablution rooms with basins fixed separately; W.C.'s for night use suitably placed to avoid the use of commodes, and the possibility of patients straying beyond supervision, and the provision of rooms for occupational therapy and other forms of treatment.

In the admission hospital, and the sick hospital in particular, but also in the closed and other units, actual treatment rooms required may vary with the methods of treatment introduced. The doctor will influence the design by

stipulating the actual forms of treatment for which provision is necessary, and the architect will plan accordingly.

Another question may be the size of the Nurses' Home, which will vary according to conditions, such as accessibility of the estate, employment of non-resident or of part-time staff and so on. The introduction of lifts in these Homes, if of three or more stories, is a likely trend.

At this point it may be useful to mention other units of the mental health service.

The Maudsley Hospital, Denmark Hill, is a notable example. This hospital, now an institution for the reception of voluntary patients only under the provisions of the Mental Treatment Act of 1930, was established in the early days of this century, and later extended during the inter-war period. Owing to the limited area of the ground, all the buildings are of more than one story, and, unfortunately, the gardens are overlooked from adjoining houses. Provision includes large out-patients' departments for adults and for children, with waiting hall, dispensary, canteen, rooms for registry, records, adult social workers and child social workers ; many consulting and examination rooms, occupational therapy rooms, gymnasia, massage and other treatment rooms, library, laboratories, etc., and residential accommodation for adults and for children in separate units. The adults' accommodation is on three floors, with, on each floor, day-rooms and single bed wards, all the normal amenities and an emergency staircase at each end. In one of the new buildings the stairs are carried up to the roof, where a roof garden, protected all round by a high wall, is laid out on attractive lines.

The children's unit is on an inverted **Y** plan and is a combined out-patients' and residential unit. The out-patients' section, with accommodation as previously mentioned, occupies the tail of the **Y** on the North and the in-patients' accommodation is arranged to the South, with six- and seven-bed wards, several single bedrooms with verandahs, balconies, the usual amenities and a roof garden and playground. These buildings are all well planned on modern lines, but the general lay-out is congested, with insufficient garden space—a definite disadvantage.

The York Clinic at Guy's Hospital is the first clinic to be erected in this country as a Psychiatric or Psychological Clinic in connection with a great medical teaching centre. It provides for the treatment of patients suffering from nervous and mental illnesses—but excluding all such as require certification—and facilities for the training of medical students. It is within the hospital grounds with a separate entrance, is six stories in height, with a roof garden compensating in part for the lack of sufficient area of land for normal gardens.

The accommodation is for 43 patients of either sex, a resident sister, and a married male nurse.

The main entrance, internal staircase and bed lift are at one end of the ground floor, on which are the main administrative rooms—interview rooms, doctor's office, sisters' office, nurses' room, library, lounge, occupation room and a flat for the married male nurse. On the basement floor are the gymnasium, dining room with servery, laboratories, various store rooms and

calorifier room. On the upper floors are the patients' wards, with a central corridor having on one side three-bed wards and single-bed wards with a central duty bay, and, on the other side, rooms for a doctor, sister and occupation therapy, servery and usual amenities. An emergency stair provides for escape in case of fire from all floors and the roof garden. The accommodation is so arranged that patients of each sex may associate or may be segregated as necessary.

Other interesting new hospitals deserve description, such as Bethlem Royal on its new site at Monk's Orchard, Woodside Hospital at Cranley Gardens, the successor of St. Luke's Hospital, and others ; but time is limited, and a few remarks on the more speculative trends of the future may be more appropriate.

In these remarks I express my views on planning, and none of them may be taken as suggesting the probable trend in the policy of the Board of Control, of the Minister of Health, or of the Regional Boards.

The development of early treatment facilities for patients showing symptoms of mild attacks of mental illness, the carrying into effect of the provisions of the National Health Service, the increase in treatment of out-patients, the provision of additional or new units for these services, whether within or outside the curtilage of the mental hospital in conjunction with general hospitals, teaching hospitals and universities, will all affect the planning of future institutions. It is probable that psychiatric wards for such cases may be provided in general hospitals. Such wards will contain provision for each sex, and will be planned more or less in accordance with the principles set forth in the Board's pamphlet. The patients probably will be mostly non-certifiable, requiring a short period of treatment in bed, and in the convalescent stage ; hence there will be wards for small numbers of beds, with a number of single rooms, dining and day-rooms, duty rooms and other usual amenities, an occupational therapy room, possibly other treatment rooms, and consulting rooms and examination rooms for specialists. Surgical treatment, massage, etc., will be available in the appropriate department of the hospital.

The out-patients' department of a general hospital seldom has sufficient accommodation available for all the needs, and this suggests that a separate detached psychiatric unit may be necessary. A similar argument applies generally to the other new units now on the horizon. New buildings, specially designed, will probably be required. To illustrate the trends in this direction, I prepared several plans for such units for Dr. Blacker in illustration of the views propounded in his book on *Neurosis and the Mental Health Service*.

These plans are in two groups. One group, referred to as Out-patients' Clinics, shows provision for out-patients only. The other group, referred to as Psychiatric Units, shows provision in addition for in-patients.

Operating suites, X-ray and other departments, staff and domestic facilities, etc., are not included in these plans, on the assumption that these units would be part of general hospitals or other groups of buildings where these facilities would be available.

All these plans are based on a definite list of requirements. They are *not* TYPE *plans*. I dislike the idea of type plans, the issue of which lends to repetition and lack of initiative in design. In all cases the best procedure is to have

prepared a definite list of requirements of the accommodation in the proposed unit, and for the architect, in collaboration with the medical adviser, to prepare the necessary plans.

Changes in matters of policy will affect the future and the actual planning trends, but policy matters are beyond the scope of this paper, and decision upon them will be awaited with much interest. Upon them will depend probably the future of mental hospitals, and whether they will provide for all the needs, including teaching facilities within one estate, or whether some separation will be considered necessary. There are two schools of thought on this question, which I leave with you.

THE PLANNING OF MODERN PSYCHIATRIC UNITS.*

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I welcome the opportunity of presenting this short paper to the meeting, particularly as I have just returned from the United States, where I have seen something of the modern trend of psychiatry in that country.

The memorandum on the future organization of the psychiatric services, published by this Association in 1944, defines a psychiatric unit as that part of a general hospital, whether in-patient or out-patient, which is set aside for the treatment of mental disorders, with or without legal formalities.

It will probably be accepted by all that there should be the closest possible relation between psychiatry and general medicine, and that therefore the psychiatric unit should be situated in close proximity to a large general hospital, and that it should combine both in-patient and out-patient facilities.

There are those who would carry this close relationship with general medicine to the point of making the psychiatric unit an integral part of the hospital, in the sense that it would consist of a number of wards dedicated to psychiatric service. This, I believe, can only have a cramping effect on the work of the unit, from the point of view of the patient as well as the psychiatrist, and my own feeling is that the unit should be a separate self-contained block, but sufficiently near to the general hospital to allow of free access by means of a covered way. This leaves ample room for expansion, but at the same time allows of free use of the hospital facilities by such patients as are capable of utilizing them. This is the set-up found in the Michigan University Neuro-psychiatric Hospital, which was opened in 1939 in association with the Michigan University Hospital.

Consideration of the concluding paragraph of the above definition leads naturally to a discussion as to the scope and facilities of a psychiatric unit.

It will, of course, receive on a voluntary basis all patients, whether neurotic or psychotic, whose behaviour is such that they can associate with others without undue embarrassment to either. I understand that in the present state of the law all such patients would require to sign a voluntary application form within the meaning of the 1930 Act. This at once marks the unit in the eyes of the public as a place somewhat different from the rest of the hospital with which it is associated, and consideration might well be given to the removal of this handicap.

However, if the unit is to cater adequately for the early manifestations of mental illness, and particularly if it is associated with a teaching hospital,

* Read at the Annual Meeting of the Royal Medico-Psychological Association, at Eastbourne, 9 July, 1947.

it will have to accept patients who are not volitional, or who from time to time show disturbed behaviour. This will have some bearing on the structural design of the unit, and here may I pay tribute to Dr. Masefield's conception of the use of the temporary treatment clause, and express the hope that in the very near future the law will be so amended as to allow all *non-voluntary* patients to enter hospital in the first instance on a temporary treatment basis, without certification.

Should such a unit include child psychiatry within the ambit of its service? In certain of the University clinics which I visited in America one floor was devoted to the care of children suffering from behaviour disorders, and I am bound to say that it created a very unfavourable impression on my mind. Their destructive propensities had been expended to the fullest extent on the fabric and fittings, and the conditions here were in startling contrast to the rest of the clinic.

I think that the same criterion of selection should be applied here as in the case of adult patients.

Finally, there is the question of patients referred for observation or treatment by the courts. In connection with the projected establishment of an early treatment centre in Birmingham, I have given much thought as to how such patients should be dealt with, and I have to confess that I have not found the solution. In one very well known American clinic, not only did they have their own prison and court within the building, but in many of the wards police officers were to be seen sitting by the bedsides of patients remanded from the courts on a charge of suicide. This seems to be a most unfortunate practice, and one bound to have an extremely bad effect on other patients and the public in general. I do not believe that such patients should be catered for in the type of psychiatric unit envisaged in this paper.

With regard to the size of such a unit, the trend of opinion both here and in America is to the direction of quite small units, and I was interested to hear from the Director of the Bellevue Clinic that he regards 90 beds as the maximum.

Unfortunately this problem has to be viewed from other angles than the purely psychiatric, and economic features force us to consider a much larger unit than this.

In the past the average mental hospital psychiatrist in this country has found his efforts completely stultified by the large numbers of patients he has had to care for, and in many cases he has ended up with a feeling of frustration, and has either left the service or settled down to a routine of writing quite useless case-notes on large numbers of patients, vainly trying to convince himself that he is making some contribution to the study of psychiatry. This, however, is not a difficulty confined to medical personnel—it applies to nursing staff and others. I have throughout my 25 years in mental hospitals seen quite good nurses gradually deteriorate intellectually and emotionally, losing all interest in everything but the routine administration of the ward. This is a matter that I will refer to later under the head of staffing, but for the moment I suggest that the maximum figure for a psychiatric unit should be 200 beds. This is sufficiently large to give an economic lay-out, but small

enough to allow each member of the staff to have a detailed knowledge of each patient, and to maintain intimate personal contact with him.

I am convinced that aside from any specific treatment that may be carried out, the most hopeful approach to the early schizophrenic is constant unremitting personal attention.

I have said elsewhere that it is at least arguable that the accumulation in hospital of large numbers of schizophrenics, who of necessity must be left very much to their own devices, is a factor in producing the chronic deteriorated patients, and in this connection I believe that if a patient is not responding to treatment, then if his behaviour at all permits, he is much better off at home.

I am sufficiently old-fashioned to believe that the best administrative set-up is to have a medical man as head of the hospital. A psychiatric unit of 200 beds is sufficiently large to warrant a whole-time medical director, but with this number of beds he should find no difficulty in devoting three-quarters of his time to clinical work.

It may be interesting to give here the figures for some of the American University Clinics.

BELLEVUE has 400 beds, with an annual in-patient turnover of 20,000, while its out-patient department handles some 30,000 patients per annum.

The PHIPPS CLINIC, BALTIMORE, has 92 beds, with an annual turnover of 200.

By contrast, the INSTITUTE OF LIVING, at HARTFORD, probably the most luxurious psychiatric set-up to be found anywhere—for staff as well as patients—has 400 beds, with an annual turnover of 1,396 cases.

The WESTERN STATE HOSPITAL AND CLINIC, at PITTSBURGH, which was opened in 1937, has 200 beds, and comprises 17 floors.

One might now consider in a broad way the question of structural lay-out and design. I was struck with the severely institutional lay-out of some American clinics, though this applied more particularly to the State hospitals. I believe it is a mistake to think too much in terms of bricks and mortar. There is a very real psychological value in the impression made on patients by the physical appearance of the building in which they are to be treated, and I would suggest that considerable thought be given to the lay-out of the entrance hall and waiting rooms particularly. The importance of this was brought home to me very forcibly in one hospital where the admission units and examination rooms were housed in the basement.

It is true that the personal approach to the patients is much more important than the physical surroundings in which that approach is made, but I am sure most of us have been depressed from time to time by the cramped and overcrowded places in which we have had to work.

I should like to see the psychiatric unit of the future planned with a spacious and imposing entrance hall, and opening off this the administrative offices, and a generous allocation of reception and waiting rooms for the interviewing of newly admitted patients and their relatives. The out-patient department of the unit would be situated in this vicinity, and I would suggest that here there should be a sufficient number of general rooms to allow patients to wait in small groups rather than in one large waiting hall. This, in addition to the

general advantage of comparative privacy, facilitates the segregation of patients whose symptoms may be distressing to others. There should also be sufficient accommodation here for auxiliary staff, such as clerical and social service, and an important item is a central filing and record room. So often records, even of patients under treatment, are relegated to some out-of-the-way lumber room, where they accumulate dust and dirt and are never readily available. One of the things which impressed me most in American hospitals was the organization of the records department, and in this respect they are certainly well ahead of any hospital I have visited in this country.

Then, too, the Americans make considerable use of basement accommodation, and since these have to be provided to take the various service lines, it should not be difficult to build them in such a way as to provide well lighted accommodation for laboratory and allied services. I realize that the suggestion that these departments should be relegated to the basement will arouse a storm of protests from the interested parties, but I have seen in several hospitals basement lay-outs containing these services which could not be criticized in any way.

I need hardly say that the out-patient department should contain a sufficient number of rooms to allow each psychiatrist to have his own consulting room, and to permit of expansion. In this connection it should be borne in mind that other personnel, including psychologists and social workers, require facilities for private interview. Provision should also be made for the use of individual methods, such as narco-analysis, so that the consulting room need not be out of action while a patient is recovering from the procedure. This raises the question of the use of convulsive therapy on an out-patient basis, and I might refer briefly to the development in some hospitals of a unit for this purpose. It consists of a small treatment room opening off a waiting room, and having on either side of it a small dormitory of half a dozen beds or so. Each patient is treated individually on a trolley bed, and is then wheeled into the dormitory and transferred to bed. While this is being done a second trolley is in use for the next patient.

Whatever may be said about the necessity for this form of treatment, it is one which imposes considerable emotional stress on patients awaiting it if they are within sight or sound of the procedure, and the foregoing seemed to be an excellent solution of the problem.

There will, of course, be provision for lecture and demonstration rooms for nursing staff, and in the case of a teaching hospital, for medical students also. There should be a spacious medical library and at least one conference room, and also a rest room for the use of medical and other staff. This might be combined with a small canteen ; the latter provision is, I feel, of some importance, as this is often the place where various staffs meet in an atmosphere which is conducive to mutual education and the interchange of ideas.

So far as in-patient accommodation is concerned, the primary consideration should be quite small wards, of not more than 10–15 beds each. Since psychiatric patients are likely to make a longer stay in hospital than the average it might be worth considering a design I saw in one clinic, where each bed was divided from its neighbours by a partition about $3\frac{1}{2}$ ft. high. This

provides a measure of privacy, and yet does not interfere with nursing observation. There should also be two or three private rooms attached to each ward for the use of patients who wish to pay for such accommodation or whose symptomatology demands it. Patients who for the most part can be nursed in the open wards may from time to time develop mild behaviour disturbance, which necessitates isolation.

There should also be at least two interviewing rooms off each ward for the use of medical and allied staff. These should be so designed that they can be used for visitors to patients who are able to be up and about. Probably a small amount of sitting-room accommodation will be required on some wards and might take the form of a sun porch.

In practically every hospital the outstanding deficiency is in storage space for linen and clothing and in soiled linen accommodation. I hope this point will receive more attention than it has done in the past—indeed there seems no reason why use should not be made of chutes leading to a central sorting room.

This brings us to consideration of access to and from wards in regard to food supplies and removal of waste. Much needless labour is imposed on nursing and domestic staffs because of bad lay-out in this respect. It might be no bad idea if every hospital architect spent a few weeks working in the wards and kitchens of the average hospital before putting his plans on paper.

In the type of hospital we are considering there seems no objection to the use of lifts, and this would ease the burden of internal transport considerably.

So long as it is necessary to apply the somewhat crude methods of physical treatment in use to-day it will be an advantage to have a central unit for this purpose, particularly for insulin therapy, so that both sexes may be treated in common, with resulting economy of time and staff. This should be sited so as to be readily accessible from wards on both sides of the building.

Since the stay of patients in a psychiatric hospital is measured in months rather than weeks, provision should be made for an Occupation Therapy Department, a central reading room and library, and a small combined recreation room. There should also be a small canteen for the use of patients.

Particularly in the case of units attached to teaching hospitals there will probably be a small number of patients continuously disturbed, even though not to the extent found in the average mental hospital. For such patients consideration might be given to the construction of a small section isolated by sound-proofing from the rest of the unit. This is a project which is to be incorporated in the new building programme of one of the Massachusetts State Hospitals.

Staffing.

The basic unit in staffing will be a team consisting of the psychiatrist, psychologist and psychiatric social worker. The proportion of these to the patient population will depend on the extent to which use is made of auxiliary staff, and having regard to the relative dearth of qualified specialists in these fields, the extensive use of auxiliaries has much to commend it. This is a distinctive feature of American psychiatry, where free use is made of graduate

nurses who have been trained in the administration of various forms of physical treatment, and in psychological testing. Indeed, there is much to be said for the employment of receptionists, clerical workers and others with a background of psychiatric nursing.

The proportion of psychiatrists to patient population is a difficult matter to decide, as it will depend to a large extent on the clinical orientation of the unit. Our knowledge of the basic factors underlying mental illness is so meagre that we cannot afford to neglect any method of treatment which holds out any hope of success, and which is reasonably safe. I would therefore plead that the therapeutic plan should be conceived on the broadest possible basis.

Earlier in the paper I stated my belief in having a clinical psychiatrist as the head of the unit. The choice of this officer is probably the most difficult problem in staffing, since a person with preconceived .deas can stultify the work of every other member of the team, and produce a sense of frustration which will nullify the most perfect architectural lay-out.

It cannot be too strongly insisted that in the present state of our knowledge all view-points should be represented on the staff, and each member of it should feel free to develop his therapeutic ideas, within reason.

I am impelled here to touch on what I regard as the unhappy concept of neuro-psychiatry—as if there were some special connection between these two disciplines to the exclusion of medicine in general. It is perfectly true that a good psychiatrist must have a sound knowledge of neurology and vice versa ; but anyone with a wide experience of the psycho-neuroses must realize the multifarious points at which psychiatry impinges on general medicine, and the imperative necessity for a competent psychiatrist to be, not merely a skilled neurologist, but first and foremost a good general physician. I am aware that this view will arouse considerable opposition, but I feel that this concept of neuro-psychiatry is one into which we have drifted, rather than developed by logical argument, and I think we should face up to the implications of it, and consider whether such a development is for the ultimate good of either discipline, and what is more important, whether it is to the benefit of the patient—or his detriment.

I referred just now to the dearth of competent psychiatrists. With the expansion of the psychiatric services this position will be aggravated, and it therefore behoves us to make the most economic use of such as are available. Two things which impressed me on my American visit were, the much greater use that is made of auxiliary staff and the generous provision of individual consulting rooms. Even in the State Hospitals each medical officer had his own interviewing room on the ward, quite distinct from what we call in this country a clinical room. Each of these rooms was provided with a dictaphone, so that time was not spent in writing out long case-notes and observations. The psychiatrist's observations were recorded on the dictaphone and then sent to a central office, where they were typed out and incorporated in the case folder. These latter were filed in a central record room, and were readily available when required.

I feel this paper would not be complete if I did not make some reference

to the dangers inherent in the setting up of psychiatric units on the lines envisaged in the R.M.P.A. Memorandum.

Unless there is the freest possible interchange of staff between the clinic and the neighbouring mental hospital, and not only medical staff, but nursing and allied staff as well, there is great danger that the mental hospitals will be isolated from the main stream of psychiatry, and become over-loaded with long-term and chronic patients. This can only lead to deterioration in standards of care and treatment, and a tendency for the mental hospitals to be staffed by second-rate personnel. I got the impression that this situation had already developed in America, where in some areas there is a really distinct line of demarcation between the University Clinic and the State Hospital.

That this impression was not entirely groundless is shown by the following extract from an article in the most recent number of the American journal, *Mental Hygiene*, entitled "Mental Hospitals, 1946." Here is the relevant quotation :

> "Something else is going on that though highly desirable in itself is, I fear, more of a hazard than a help. I refer to the increasing trend towards the establishment of receiving hospitals, and psychopathic wards in general hospitals, in which prompt and intensive treatment is given. Already such treatment centres are attracting personnel away from State hospitals. We must be on our guard lest the State hospitals come to be considered nothing more than dumping grounds for hopeless cases, and become even more custodial and inferior than they are."

I feel that this is a problem which should be discussed very fully, and I hope will be discussed at this meeting, therefore, I do no more than raise it.

In conclusion may I, with that outstanding propagandist in psychiatry, Dr. C. Charles Burlingame, express the hope that the psychiatric unit of the future will be a place—

> In which the best minds of the profession will accept the challenge of psychiatry, and specialize in this branch of medicine.
>
> In which the patient as an individual rather than the disease will be treated.
>
> In which all forms of accepted therapy will find a forum.

A METHOD FOR DETERMINING THE TYPICALITY OF PERSONALITY DESCRIPTIONS. (APPLIED TO ASSESSING THE NOTICED AFTER-EFFECTS OF PREFRONTAL LEUCOTOMY.)

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I. The Problem.

If we have a group of letters describing how discharged post-leucotomy patients are getting on, and what they are doing (1), it is useful to be able to determine how far the traits reported can be regarded as typical of post-leucotomy patients in general, peculiar to a particular clinical class, or unique to a single patient. Information of this kind clearly helps a doctor to predict what personality traits are likely to be noticed after the operation.

It can be seen that success in almost any comparative study of personality depends upon the way in which a problem of this kind can be dealt with. It can also be seen that if we are to distinguish clearly between the frequency with which a given trait is reported and the frequency with which it actually occurs, a person's *character*, in the sense of what he is in himself, should not be confused with his *personality*, in the sense of the impression he makes upon other people.*

The method of handling reported observations described in this article was originally used for the comparative study of psychological projection records (3). The principle is, however, quite general, and can be applied to the comparative study of almost any descriptive material which permits of being classified.

II. Technique.

Let us suppose that a number of letters have been obtained from discharged post-leucotomy patients and from their near relatives, describing how the patients have been getting on since they left hospital. Each letter is first read through, and each distinct statement in it separately marked, regardless of any theory as to its interpretation. For reference purposes each statement is conveniently indexed. Virtually the same statement occurring more than once in the same letter is given the same index mark, and is considered as

* Any personality traits described depend upon the character of the person who gives the description, as well as upon the character of the person described. In contrast with the definitions suggested by Allport and others (2), character is therefore probably best defined in accordance with its accepted English usage, as *the qualities which distinguish an individual*, while personality is best defined as *the conative qualities of a person's character as they impress other people.* For the comparative study of reported personality traits, some distinction of this kind seems essential.

amplifying a single trait. The letters are next classified according to whether they are self descriptions or descriptions given by other people, and sub-classified according to the type of illness from which the person was suffering before the operation.

When all the letters have been indexed and classified, the marked statements in the first letter which comes to hand are entered on a table in a line from left to right against the name of the person described. To reduce the size of the table, abbreviations, with their appropriate indices, can be used. The second letter to hand is treated in the same way, with the exception that each statement in it which resembles a statement in the previously tabulated letter is entered vertically below it, regardless of the order in which it occurs in the letter, while statements which differ from them are entered to the right of the statements previously tabulated. Each subsequent letter is treated in the same way. The classes of letters to be compared are kept separate, but the same order of entering the statements on the table is adhered to throughout. When the table is completed, it gives horizontally all the statements made about one person, and, vertically, the frequency with which similar statements are reported in any class* or sub-class.

For convenience, groups* of similar statements can be given appropriate names. The names used are not intended to be explanatory. They are simply convenient labels, which are themselves explained and amplified by the individual statements in the group. Thus the group name " cheerfulness " can be used to include, and is at the same time explained by, such statements as : " I find after all the world is a nice place to be in," and " Her outstanding qualities now are her gaiety of spirits, her outstanding love of life." It is the contents of the group, its consistency, and the degree to which the various qualities reported confirm and elucidate each other, which is of interest. The group name, if thought more desirable, could be a number. The method is essentially inductive, not deductive. It aims at assessing, from the frequency of its occurrence, the degree to which any quality which is reported can be regarded as typical for a given class, or unique to a single individual, not how far any individual person conforms to a preconceived type, or exemplifies some previously accepted explanatory theory.

As the initial table grows and data accumulate, the original groups in which statements are placed are sometimes found to need subdividing, while others are seen to be virtually the same. It is therefore invariably necessary to revise the initial tabulation. When all the statements have been appropriately grouped, the frequency of similar statements is computed. A table is finally prepared in which the linear statements concerning each person are arranged in column order according to the total frequency with which similar statements occur in the entire population considered. Arranged in this way, the final table shows, on the left, the most typical statements, followed by statements arranged in decreasing order according to the frequency with which they were made, with, on the extreme right, statements which were unique in the

* For clarity in the present communication the terms " class " and " sub-class " are used to refer to the classification of reports according to the patient's clinical diagnosis, etc. The terms " group " and " sub-group " are used to refer to the technique of grouping similar statements together. A " group " is not, as in biology, a subdivision of a " class."

sense that each was said of one person only. The whole of the original qualitative information is in this way retained. The several statements concerning any one person can therefore be compared with each other. The statements included in any one group can be critically examined. Finally, the frequency with which similar statements occur in the several classes and sub-classes of patients can be compared, and the degree to which they may be regarded as "typical" for the whole population, or "peculiar" to a particular clinical class, can be assessed. For simplicity of exposition, the technique has been described as if all the statements to be compared were entered in order on a single sheet of paper. In a relatively simple investigation this is reasonably possible, and is, in theory, what is always done. In practice it is more economical in the long run to have each statement recorded at the outset on a separate index card. In this way statements to be classified, compared and grouped remain completely fluid and orderly throughout the inquiry, and it becomes unnecessary, at intervals, to re-copy them.

III. Synthesis of the Information.

The qualitative and numerical information obtained can be immediately utilized to build up, for an entire class, a composite picture of the "typical" personality described, arranged in order from the most frequently reported traits to those least frequently described. Thus, Frankl and Mayer-Gross found the typical discharged patient after leucotomy was described as—

"Physically healthy, a good eater and sleeper, with a marked feeling of well-being. His prevailing mood is cheerfulness, he does not worry, is happy and contented, and shows it. He has a high opinion of himself and his abilities. . . . He leads an active life, is restless, likes movement and change. His interests and hobbies are varied and variable, with a preference for light entertainment and superficial pastimes. He is easy-going, a good mixer, fond of social life and of being on good terms with everybody. . . . His relations to the people around him often are without depth of feeling. He shows litttle sympathy or consideration for his next of kin, or for anybody else. He neither regrets nor repents for whatever he may have done or said. He may be self-willed and headstrong, and unable to see the other's point of view. He tends to quickly passing outbursts of temper . . ."

The typical traits observed by other people can be compared with the typical self observations. Thus, for the discharged leucotomy patients :

"Forty-eight letters comment on the patients' behaviour towards their relations, all patients contending that they get on very well. . . . (But) Ten out of 29 relatives who reported on this point found it difficult to live with the patient."

The traits observed in one clinical class can be compared with those observed in another. Thus, Frankl and Mayer-Gross found :

"Eight of the 14 letters mentioning persisting symptoms are from obsessionals and their relatives."

According to one's predilections, the information can be arranged as a purely qualitative description of typical traits reported ; as a series of numerical tables giving, for each clinical class, the observed incidence of statements falling into characteristic groups ; or as a combination of the two. The

description of any person can be divided into those statements concerning him which are found to be typical of his class, and those which are unique to him, and therefore distinguish him from the class of which he is a member. From the incidence with which the statements concerning him are typical of his class, a numerical quotient can be computed, indicating the degree to which he can be regarded as typical, and, if considered desirable, subsequently used as a measure of his "typicality." From the statements which are unique to him as an individual, it is possible to show how he differs from his class.

Extending the same technique it is clearly possible to determine the similarities and differences between descriptions of the same people given by different observers. In this way it is possible to determine the typical qualities noticed by observers in general, the particular qualities which any given observer tends to notice in other people, and thence the degree to which any description can be regarded as portraying the character of the person observed, or as revealing the character of the person who makes the observation. This information can be expressed qualitatively as an account showing objective and subjective responses occurring in the descriptions, or numerically as a correlation co-efficient showing the degree of agreement between the reports.

The technique solves a number of problems encountered in personality studies. The present communication describes its application to one of these. The same technique is being used for the comparative study of psychological projection records given by groups of normal and abnormal children, which, it is anticipated, will in due course be published.

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CEREBRAL PHYSIOLOGY AND PSYCHIATRY.

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Introduction.

This contribution is itself introductory to a larger subject, and is an attempt to present some physiological observations in a way that may stimulate the interest of psychologists and psychiatrists. Viewed from a biological standpoint, man is limited in his thinking and behaviour by his innate constitution, anatomically and physiologicallly. As a living, functioning individual he is much more than the mere sum of his parts, yet it is a fact that structurally he is made up of reflex arcs (receptor endorgans, afferent nerves, central nervous system, efferent nerves and effector organs). The vital functions of nutrition, respiration, circulation, excretion, reproduction, locomotion and metabolism are effected by standard types of reflexes which pervade the vertebrate kind, so that a dynamic reflexological approach to normal and abnormal human behaviour should be revealing. Man is stimulated by his total environment to respond as a complete being, and this full activity is retained as experience which modifies subsequent behaviour. That being so, the nature of integration of these reflexes and the ways in which they are influenced by experience constitute a subject very pertinent to the study of psychology and psychiatry. Something of that nature forms the material of this paper.

To ensure a scientific basis, only such observations are noted as have been made personally, on the actual abnormal behaviour of patients or on the investigation of that behaviour through speech with the patients, or more usually by the use of both methods. The observations on the *development* of behaviour were made in the course of investigating the "life history" of patients by interviewing them and their relatives.

The conclusions concerning children were developed at child guidance clinics, but perhaps more fruitfully by informal observations on the families of my friends. The unobtrusive visitor to the home of enlightened parents has a strategic advantage, and is able to observe the spontaneous activities of children, and in discussion with the parents to acquire a more intimate and detailed record.

The interpretation given to the observed facts derives from an appreciation of the experimental studies of various schools of neurophysiology, as is brought out in the ensuing context.

First of all an outline of differentiation in the Pavlovian sense is given, together with the changes this undergoes with the onset of sleep and in neurotic breakdown. With such understanding of animal behaviour as this affords, instinctual human behaviour is then considered in health and disorder. Next, a physiological interpretation of ambivalent behaviour in psychiatry and the analysis of an actual case from a physiological viewpoint is given. A short discussion of some implications of this work completes the article.

1. Experimental Basis of Differentiation in Animals.

Positive Conditioning.

The approach adopted here is based on the studies of Pavlov (1) and Horsley Gantt (2), and the relevant experiments show that if such a stimulus as the musical note C, lacking any capacity to evoke a stereotyped response, immediately precedes an injurious stimulus which does possess such a capacity, then the former stimulus acquires a new property of evoking the withdrawal response previously produced by the neural impulses of the latter only. This acquired property develops with repetition.

If, after establishing positive properties to the note C one sounds a note adjacent to it, such as D, one finds that D has acquired like properties. The cortical engrams corresponding to notes further removed, such as G, are also positive in lesser measure. The important point of principle here is that through an internal neural process, an inaccuracy in the registration of actual experience has occurred. Because C has positive effect for a vital function, D and G have similar effect in lessening degree. In nature this is valuable, for similar environmental stimuli tend to have similar effect for an animal. However, another function of the cortex—inhibition—tends, with experience, to limit this inaccuracy, and it is effected through negative conditioning.

Negative Conditioning.

If a stimulus which has acquired positive properties acts on the sensorium and is *not* followed by its basic inborn reflex, it develops the negative property of reducing that inborn response. This new inhibitory property is built upon outmoded positives. It develops with repetition.

Differentiation—the Combination of Positive and Negative Conditioning.

If note C is always associated with a painful stimulus, it acquires positive withdrawal effect, and if notes D and G, which have acquired spontaneous positive effect only through internal generalization, are always non-reinforced, they lose this property and then are inhibitory. This combined activity of positive and negative engrams based upon the *same* inborn reflex is called *differentiation*. It will be clear that an increased selectivity to environmental stimuli is effected by this combination, for the cortex now induces positive activity to C and negative activity to D and G (whereas formerly D and G were merely "less positive.").

Cortical engrams thus vary in degree of both positiveness and negativeness, and may work with or against each other according to determinable laws.

These influence, and themselves are influenced by, the state of the unconditioned centre of the basic reflex system. These interacting processes are constantly changing.

The unconditioned reflex with its positive and negative associations together form the basic unit, structurally and functionally, for the study of neural dynamic changes occurring in biological adaptation.

Differentiation during the Onset of Sleep and in Neurosis.

In the normal waking state a "large" stimulus results in a large conditioned response and a "small" stimulus results in a small conditioned response. During the transition to sleep and in neurotic breakdown, it is found that the cerebral cortex passes through distinct phases of functional activity. The first of these is the *equivalent phase*, in which stimuli of large and small intensities give responses of the same size. This passes into the *paradoxical phase*, in which stimuli of large intensity evoke small responses and stimuli of small intensity evoke large responses. The last phase is the *ultraparadoxical*, where reversal of effect obtains, positively conditioned stimuli then giving negative responses and negatively conditioned stimuli giving positive responses. These phases should be borne in mind when abnormality of the differentiating function is being considered.

2. The Normal and Ultraparadoxical Phases in Instinctual Behaviour in Man.

A child is born with a minimum of learned behaviour from the recency of completion of its nervous system and the constancy of its intrauterine environment. Yet it has the faculty to record conditioned behaviour.

Nutrition.

In the beginning, the stimuli preceding the fufilment of the nutritional function are relatively stereotyped because the food is milk and the source—the mother. The sight of the breast, the contact of the breast with the child's hands, face and mouth, being the most immediate precursors, all become of positive effect. Gradually, the sights and sounds of the mother as an individual become conditioned stimuli to the unconditioned food reflexes. By differentiation, the father and other people, having become positive through internal generalization since they resemble the mother, will tend to become of negative conditioned sign as they are not followed by reinforcement.

As the feeding habits widen in scope a host of olfactory, visual, auditory and gustatory stimuli acquire positive effect as they impinge upon the child's sensorium prior to food. The sight and smell of food and the noise of dishes, the activity of preparation and the sight of others eating are of this category. There is, therefore, another group of objects which acquire positive effect through internal generalization arising through the resemblance they bear to actually positive objects of food and drink. So faeces and urine, solid and fluid poisons, blankets, clothes, hands, toys and other objects, coal and dirt, slops and soap, after acquiring this positive significance (for the child puts

these to its mouth without discrimination) undergo negation by differentiation. The child's sensorium is stimulated by them, yet the child is prevented from eating them, so by non-reinforcement they become negative. In this way the mature differentiated systems in the adult are built up through a long process of development from childhood, and one system supersedes previous systems as living conditions change.

It is evident that the mature cerebral cortex has in the course of its existence built up differential systems through experience based upon the instinctual functions. These systems ensure that the organism, in adapting its vital functions and the environment to each other, works realistically in accordance with its previous history. It will clearly respond positively in one environment and negatively in another.

Mental health is characterized by just such efficient adaptation. The change occurring in the differential systems in the severe mental disorder schizophrenia is one of partial or complete reversal, and the syndrome is the expression of a cerebral cortex in the ultra-paradoxical phase. These cases are generally described as having lost all interest in their former pleasures and pursuits on the one hand, on the other as having depraved, suicidal or anti-social habits. These are but two inseparable aspects of the one phenomenon —differentiation –for by reversal in the course of intracortical disfunction, the subject responds positively in a situation that is negative in his total experience, and negatively (by inhibiting a response) in any situation that is positive in his experience. These reversals of acquired differential systems based upon inborn reflexes take many and various forms. Though determined by the individual experience of the subject, they do conform to general type, as is shown by the following behaviour patterns which are commonly observed in mental hospital practice.

In nutrition, food and drink assume a negative effect and the patient refuses to eat and inhibits digestive secretions, treating the food as dangerous and disgusting. Poisons, faeces and urine, clothes, hands, dirt and many other articles normally of negative moment through differentiation become of positive sign for feeding and are treated accordingly. A mother or mother-object will also become negative for nutrition and may then be regarded as a poisoner. Sometimes clear-cut reversal of positive and negative associations does not develop, but the tendency to such a state exists in the form of mixed associations. Such patients respond to food as if it were contaminated or poisoned by some agent or substance.

The above is a brief outline of the development of conditioned differential systems and their complete or partial breakdown as illustrated in the nutritional responses. The analogous processes in the remaining groups of reflexes fall to be considered.

Excretion.

The defaecating and urinating reflexes fulfil the excretory function (excluding the actual secretion of urine and sweat). The adequate unconditioned stimuli are distention of the rectum and the urinary bladder. The response is voiding of these viscera through muscular action, i.e. contraction of the

extrusors and relaxation of sphincters. Training consists in placing the child in a suitable environment prior to the action of these reflexes. The mother thus, in a young child, becomes a positive condition for these functions, and the sight and touch of the lavatory or chamber pot will become immediate conditions. By differentiation, the clothes and bedding, floor and furniture become of negative effect. These objects, initially positive by internal generalization or by actual experience, undergo inhibition by non-reinforcement in training.

In the ultraparadoxical phase, clothes, beds, floors and so on acquire the property of evoking the response of voiding, and that this is not merely incontinence (i.e. uncontrollable defaecation or urination) is observed in the "purposefulness" and "deliberateness" of the behaviour. On the other hand, the lavatory, commode or bedpan tend to negative sign, and the patients are said to be restraining the act or to be "holding themselves in" when placed in what are normally appropriate conditions for excretion.

Locomotion.

The locomotor function is constituted by all reflexes resulting in movements destined to preserve the life or integrity of the organism. Thus stimuli, injurious to the skin causing withdrawal of the part; loud noises causing starts; sudden visual stimuli causing protective motor responses; proprioceptive stimuli causing as their inevitable response maintenance of any passive or active movement; grasp and other prehensile reflexes; the phasic reflexes in walking, trotting, running and galloping—all these constitute the locomotor function.

Dangerous objects become, then, of positive moment for the locomotor function and excite withdrawal movements. The total environmental stimulus constituting safety and comfort, by differentiation, acquires negative effect, and inhibits movement away from safe and comfortable environments towards danger. Such positive and negative behaviour is advantageous for survival. In these reflexes it is important to distinguish clearly between positive and negative conditions. Many behavourists tend to confuse a physiologically positive conditioned stimulus based on this reflex system, and resulting in movement away and unpleasant feeling tone (e.g. flexor reflex) with the physiologically negative which, in reality, results in *no* response or the lessening of an already existing response.

Positive conditioned stimuli arise from objects which impinge on the sensorium prior to injury, spankings, overbalancing and so on. Wall, tables, windows, furnishings, fires, electrical, gas and other heating and lighting equipment, stairs, motors, streets, railways, bridges, rivers, water, heights, uncomfortable postures, falling out of bed and many more such factors acquire positive sign by direct experience, or indirectly through warnings and training on the part of adults. Negative stimuli based by differentiation on the locomotor reflexes arise from factors such as constitute safe and comfortable postures, absence of the above dangerous objects—for such situations constitute a stimulation of the sensorium just as material as the disturbing factors which are positive.

It becomes clear how differentiations based on the locomotor function (excluding the highly developed systems involved in manipulatory and speech behaviour) determine the movements not merely avoiding danger and injury but also those maintaining safety and integrity. The value of this twofold conception becomes evident when reversal of the biological significance of environment is dealt with in functional disorder as in the ultraparadoxical phase.

This phase of the cortex determines excitatory responses away from safety and comfort towards danger and injury, and inhibitory responses maintain a state of constant danger. Therefore walls, tables, windows, fires, etc., as enumerated above become of negative sign for self-preservation, while objects constituting a safe, comfortable and pleasing environment become of positive sign. The abnormally functioning cortex through internal reversal of its orientating, guiding influence upon the inborn reflexes impels the subject to court danger and death and, as he would normally avoid these, so he avoids security and ease. Such complete reversal is only obvious periodically as "impulsive suicidal outbursts" in a chronic case, or more continuously in cases classified as "acute schizophrenic breakdowns." More characteristic of the confirmed schizophrenic is the inactivity which results from the mixed associations which reveal the tendency towards the ultraparadoxical phase. Here any given environment excites movement and at the same time inhibits movement, and relative inactivity ensues.

Respiration.

The respiratory function consists of reflexes of inspiration, expiration, coughing and sneezing. Respiration is naturally maintained by the subject taking measures to ensure the free supply of air. The ultraparadoxical phase may cause the subject to avoid air and attempt suicide by suffocation, drowning, strangulation, choking or gassing.

Circulation and Metabolism.

Some systems of reflexes are difficult to analyse in terms of reversed differentiation, since responses are not readily observable clinically. Such are the circulatory and metabolic systems. The former is effected by many reflexes. Briefly there is throughout the whole body a mass of effector units controlling the rate and output of the heart and relative tone of the arterioles, so achieving a distribution of blood according to the needs of the moment. These reflexes, like the respiratory, are not subject to inhibition to the extent of extinction ; yet the response patterns are attuned to environmental changes. Abnormal responses are made in functional disorder.

The metabolic function is complex, and in its conditioned reflex aspect is difficult to analyse. Emergencies, hot and cold surroundings, evoke reflexly, responses maintaining the constant "milieu interne." When food and fluid are ingested, digested and absorbed, such substances as insulin are secreted to effect assimilation. Fluid intake usually preceding as it normally must, the renal secretion of the resulting excess of fluid in the body actually conditions its own excretion. These are some of the known reflex mechanisms of

metabolic importance. It is a fact that many of these deep reflexes can be conditioned positively and negatively. The severe physical effects such as loss of weight and "toxaemia" in mental disorders are partly accountable to functionally disordered metabolic reflexes.

Reproduction.

The reproductive function is fulfilled by three systems of inborn reflexes. Firstly there are the reflexes associated with menstruation and ovulation, gestation and parturition. These are not so obviously subject to conditioning but are to a varying degree.

Secondly there are the lactational reflexes ensuring a food supply for the infant. It has already been indicated that the mother becomes of positive sign (for feeding) to the child in this relationship. It is also true that the child is of positive sign to the mother for lactation, because visual, auditory, tactile, proprioceptive and olfactory stimuli originating from the child and impinging on the mother's sensorium precede the stimulation of the nipple receptors and the inborn reflex secretion of milk. This means that stimuli from the child evoke secretion of milk and that, at weaning, the child becomes of negative effect to the mother for lactation and the cortical engrams of those stimuli undergo negation. Hormonal secretions are also subject to conditioning.

The third system is formed by the sexual inborn reflexes. The chief receptor end-organs which, on stimulation, evoke the motor and secretory, effects of the sexual response are located in the genitals. The direction of adaptation in human behaviour, through cortical differentiation based on sexual reflexes, can be traced in a composite life-history.

It is commonly observed that infants are capable of rudimentary sexual responses evoked by stimulation of the sexual surfaces, and subthreshold states of activity at the motoneurones must be included too. In the course of bathing, fondling and kissing, the mother becomes of positive sign for the sexual function. However, since it is the custom of most parents to discourage any habits of self-manipulation from developing they soon become of negative sign for sexual activity, for their presence is always linked to an absence of such reflex behaviour. In childhood, therefore, parents tend to become of negative sign, while isolation—which is an environmental stimulus—is positive for the sexual function.

As the child's behaviour widens in scope, inanimate objects such as toys or living things such as domestic pets and playmates in so far as any of these objects accidentally are associated with stimulation of the sexual surfaces, acquire positive effect for the sexual function and take their place alongside isolation as positive factors. The parents and others, who frown and forbid sexual play, however gently, however brutally, are of negative sign.

In growing older there is a definite tendency for the sexes to separate socially, in the home, at play and in school. This means that the possibility of homosexual conditioning is increased. The mild and incidental sexual behaviour characteristic of this age takes place *in the presence* of people of like sex, and does not take place or takes place less often in the presence of people

of opposite sex. Further, the subject's own person—a homosexual object—probably acquires a sexual sign through self-manipulation.

Such a homosexual differential system is often succeeded or replaced by one in which persons of the opposite sex are differentiated into two groups —a negative consisting of mother and sister objects for a male or father and brother objects in the case of a female, and a positive group made up of people of the opposite sex who are, in some distinct way, unlike the above negative objects. Subjects, during this stage, may be orientated positively to their "social and intellectual inferiors or superiors," or to those with some age or racial disparity.

Gradually, however, with the unfolding potentialities of developing body and mind and with the moulding influence of social factors, the mature conditioning to the opposite sex assumes the chief importance on the positive side of the differential system. Thus friends of the opposite sex assume potentially a positive effect for sexual function, and ultimately this is differentiated to the wife or husband. Parents, brothers and sisters, teachers, friends of the same or opposite sex, and all inanimate things which have through internal generalization or through actual experience been positive at any time in previous life, tend to become, through non-reinforcement, of negative sign. Environments constituting privacy being usually a precondition to sexual activity in all its stages are usually of positive effect, while public surroundings and company are negative for sexual function.

It will be recognized that, in this "life history" of the mature differential system based upon the sexual reflexes, there rest the seeds of many kinds of perversion—incestuous attachments, fetishism, homosexuality, auto-eroticism, exhibitionism, scoptophilia, etc.—and these seeds grow only with perverted experience on *both* the positive and negative side of differentiation. The non-reinforcement of the inborn sexual reflexes after the sensorium has been stimulated by a "normal love object" (e.g. in a male subject, a mother or sister, who, having all the attributes of females, are yet of negative sign for the reproductive function) is as important a perverting factor as actual reinforcement of these reflexes after the sensorium has been stimulated by an "abnormal love object." The former perversion by negative conditioning, though just as real, physiologically speaking, as the latter by positive conditioning, is much less obvious. It only results in inhibited behaviour, and not in outwardly expressed behaviour like the latter. Even normality, however, is subject to much variation in the duration and therefore the strength of these developmental differential systems, which may theoretically vary from zero or non-existence to lifelong deviation according to individual experience.

Having built up the mature differential system, however, living conditions still continue to change. The positive object for sexual function may cease to be reinforced by the unconditioned reflex system (from separation by death and by military or economic need or from incompatibilities of various kinds). In this case the positive object undergoes negation, and by a process of mutual induction the hitherto negated objects tend to become positive—the phenomenon commonly termed regression. The mature differential system esta-

blishes itself once more when the positive object which was tending to become negative is again associated with the sexual reflexes when normal living conditions are restored.

In the ultraparadoxical phase reversal of differentiation appears. If all objects that are normally, in the mature adult, of negative effect through differentiation are enumerated—parents, doctors, teachers, brothers, sisters, friends of the same or opposite sex, autoerotic practices, inanimate objects and public surroundings—it is clear that all of these may become of positive moment in a spurious kind of way. The resulting conditioned behaviour is usually observed clinically as "shamelessly erotic." Conversely, objects of positive sign become negative and the subject's behaviour is inadequate sexually. The tendency to the ultraparadoxical phase is shown in the confusion of positive and negative associations appearing clinically as "chaotic sexuality," under which heading Rosanoff (3) actually describes schizophrenia. Phantasies of mixed sexuality are the subjective manifestation of this, and such delusions of changed sexuality like menstruation in a male or amputation of breasts in a female are indications of the sexual disorientation.

3. The Equivalent and Paradoxical Phases of Instinctual Behaviour.

In the earlier part of this paper an attempt was made to outline normal differentiation, and to present its tendency to reversal in its schizophrenic or ultraparadoxical phase. The nutritional instinctual reflexes were used to illustrate these processes, and their manifestations in other systems were afterwards dealt with. Attention was, however, drawn to two other phases —the equivalent and the paradoxical. Unlike the reversal that obtains in the ultraparadoxical phase, where negative stimuli evoke positive responses and vice versa, in the paradoxical phase stimuli of large intensity evoke small responses and those of small intensity evoke large responses. In the equivalent phase, stimuli of large and small intensities give equal responses.

If schizophrenia is the clinical manifestation of the cerebral cortex in a pathologically fixed ultraparadoxical state (for the equivalent, paradoxical and ultraparadoxical states of hypnosis normally occur *transiently* between sleeping and waking), what of the equivalent and paradoxical phases? The former is manifest clinically as melancholia and the latter as mania. Obsessional states, anxiety and hysterical states are the lesser encroachments of whatever pathophysiological processes cause this fixity of the cerebral cortex.

Of course, each element of the cortex as a mosaic of functioning units has its own history and, in consequence, in any cortex there will be evidence of any or all of these hypnotic states existing simultaneously side by side, and this is evident clinically as "mixed states" or "alternating states" described in classical psychiatric works. It is occasionally observed that cases pass through obsessional and anxiety states to melancholia, to mania, and then to schizophrenia. This may be otherwise stated as manifestation in behaviour

of a cortex passing through minor degrees of pathological fixity to the equivalent, paradoxical, and finally to the ultraparadoxical phase.

4. The Pathophysiological Point.

The above normal and abnormal orientations based upon the instinctual reflexes are common observations. Another group of observations which is generally accepted as characteristic of the subjects of breakdown requires consideration. This concerns the ambivalence manifested by the injury or killing of some loved object or the flight from it. The pathophysiology of this behaviour is of a different order from that described above.

In an animal suffering from an experimentally induced breakdown, it is possible to identify the source of its difficulty by its behaviour. Thus, such an animal will attempt to flee from the experimental situation (Pavlov (1) and Horsley Gantt (2)), and if forced to remain in its trappings it attempts to bite the pathogenic stimuli (metronome, bell, etc.). The animal is indeed ambivalent towards these stimuli, since it responds to them positively or negatively according to its conditioned experience but, on the other hand, attacks them or avoids them in so far as they disturb normal functioning.

Applying this interpretation to ambivalence in psychiatry, it may be stated that the subject responds positively and negatively to environmental objects according to its experience but, to whatever extent these positive and negative objects are the source of pathogenic conflict, they are attacked or avoided. The fact that so often in mental disorders there is flight from people (running away from home, solitariness, roaming at night and taking to bed during the day, hiding of the face) or aggression towards people (homicidal attacks, quarrelling) is strong evidence that adaptation to persons is the source of difficulty. The subject's interpersonal relationships are ambivalent, because people are of positive or negative sign for instinctual functions on the one hand, and on the other they constitute pathogenic stimuli to the subject so that protection is imperative.

The " generalization " of a pathogenic object whereby ambivalent behaviour initially specific towards one person extends to people in general is a result of dedifferentiation and occurs also in experimental neuroses, where the animal is disturbed not merely by the specific stimulus which caused the breakdown, but by all similar stimuli. Such generalization is a different process from " internal generalization," which was mentioned at the beginning of this paper.

The complete parallel between animal and human disorders may now be outlined. In animals, responses to a pathogenic stimulus are ambivalent, and the character of other responses shows that the cerebral cortex is in an equivalent, paradoxical or ultraparadoxical phase. In human beings behaviour regarding people is ambivalent, and instinctual behaviour conforms to a pattern that is typical of the equivalent, paradoxical, or ultraparadoxical phases. In animals we know that the pathogenic stimulus *caused* the abnormal phases in the cortex. It may be deduced that in human beings persons have become pathogenic by analogous processes to the above-mentioned experimental stimulus, and so cause neuroses, melancholia, mania and schizophrenia.

5. Illustrative Case.

G. S—, aged 40, male.

This patient being intelligent and co-operative, and having insight into his abnormality at its early stages, is a good subject for investigation. The material is given in a question and answer form so that others may judge for themselves the nature of an investigation in terms of neurophysiology. Only a short sample is given, but it was from such investigations (by means of speech) and from observations of actual behaviour clinically that the observed facts forming the substance of this work were collected. The interpretation of the facts as given in the interpolated notes is based on modern concepts of nervous function.

From First Interview.

Q. What was wrong with you at first? A. "I was severely run down by electrical charges." Q. What did these charges do to you? A. "They made me very sick. There is a tightness in your head. They played with various organs later on in C ward." Q. Which organs? A. "Every one bar my heart—they did not tamper with my heart." (*Note.*—Experimental work shows that a patho-physiological point in the cerebral cortex influences the function of the rest of the cortex in an abnormal fashion. The patient expresses the subjective aspect of this total disorder.)

Excretory system.—Q. You said the charges affected your organs. What effects do they have on the actions of your organs? A. "They can either retard the matter or bring it out with a rush or pleasantly" (i.e. normally, on further questioning.) (*Note.*—He expresses all degrees of influence on the bowel from positive, through neutral to negative.) Q. That is the bowels of course. Does it affect the urinary bladder? A. "After a great deal of charges there was an extra amount of urine came out and they can make it feel full or empty." Q. Do the charges affect the *action* of the bladder? A. "They make you feel as if you required to pass urine." Q. Can they stop the bladder from working? A. "Yes, for a little while. Only the determination to get rid of the urine beats the actual waves." (*Note.*—The influence on the bladder is less marked but recognizable.)

Nutritional system.—Q. You said the charges could make you sick. What other influence do they have on feeding? A. "They can make you feel you want more than you really require. They can tighten your jaws and make you so miserable you do not want to eat. They always ease off and let you have your food." (*Note.*—This illustrates the tendency of positive food objects to undergo negation in the ultra-paradoxical phase.) Q. When? A. "At the usual hours." (*Note.*—Summation of a "time" conditioned reflex stimulus may account for this.) Q. What effect did they have on the foods you were not very keen on? A. "As long as they were good [i.e. wholesome, plain, on further questioning] you relished them more. Sometimes they deadened the taste of sweet things like chocolate. Sometimes you had your normal likes and dislikes." (*Note.*—This is a very interesting statement of his awareness of the paradoxical phase for strong positives, e.g. chocolate becomes weak, and weak positives, e.g. plain food, become strong. He also indicates the fluctuating nature of the abnormal with the normal phases—a phenomenon frequently noted in experimental work.) Q. Did you ever have these charges causing you to eat something you should not eat, e.g. poison or filth? A. "The nearest I got to that was tainted water used in the soup, but it had no ill effects." (*Note.*—The tendency to the ultraparadoxical phase is illustrated by a mixture of negative with positive signals.) Q. Does it affect saliva? A. "Yes, it can make the saliva flow more than usual or come out suddenly. It never holds it back—only increases it."

Reproductive system.—Q. What effect do they have on your sex organs? A. "They extract the reproductive fluid." Q. How? A. "They make your penis rigid and extract it slowly or else in a rush." Q. Have you any thoughts when this happens? A. "You only wish they would leave you alone. They pester you." Q. Do they affect your sex? A. "You are always conscious of being masculine." Q. Do they ever try to make you a woman? A. (*Smiling*) "They have tried that but have not managed. You always feel your own sex." Q. In what way did

they try to make you a woman ? A. " They tried to make me believe I had a womb inside me and they put some pleasant charges down the left side of my body. They can make you lose your identity just for a moment." Q. And when you lose your identity, are you without a sex ? A. " No. You still have a sex—your own. They try to make you as Satan, and he is sexless, but you still retain your feeling of sex." (*Note.*—The tendency to the sexual disorientation by reversal is illustrated by " mixed phantasy.")

Pathophysiological point.—Q. Who works this ? A. " You get the impression there are men and women." (*Note.*—The source of the disorder lies in people.) Q. Do you want to attack or run away from these charges ? A. " You wish they would leave you alone to your natural life. I tried to hang by the arms from a tree to break the current, but it was just the same—it kept contact. I went bus runs to see if distance would break it. I stood on a rubber mat too." (*Note.*—He attempts to avoid the source of disorder.) Q. It seems to be something you try to avoid, then ? A. " Oh yes. It is not pleasant—your thoughts being listened to." Q. Have these charges ever caused you to attempt suicide or to do yourself injury ? A. " They have never caused me, but they have given me the feeling, I should like to hit my head on the corner of a table or something—on a wall—anything that will hurt. You want to try that but dismiss the idea from your mind. An inclination to kick someone else to relieve your feelings." (*Note.*—He, being a person (even to himself in so far as he sees himself in mirrors, or sees, smells or touches his own body) is a source of disorder, and so is attacked as others are. The reversal of locomotor conditioned reflexes is also illustrated since walls and tables are " to be avoided " but he " is impelled towards them.") Q. Would a table do ? A. " No, It would have to be a living person." (*Note.*—The specific need to attack people is shown.) Q. Have you been troubled by them long ? A. " Electrical charges started two days before admission. I was in one job at 23 years and people thought I had lost my identity, and they thought I required sexual intercourse to get my nervous system into working order. Q. Did you think they were right ? A. " No. I knew positively that they were wrong. I was very much annoyed with them." Q. Men or women ? A. " Both. Women went through the motions of sexual intercourse to keep me in mind of it and men spat on the pavement to suggest reproductive fluid." Q. What did this mean ? A. " That I have intercourse with a girl I worked with, whom I admired. She was eighteen and too young to marry, and was not shy enough. She was too bold."

Locomotor system.—Q. Does it affect your muscles ? A. " It can cause cramps in your thighs, under your chin and fingers."

From Second Interview.

Excretory system.—Q. Did these electrical charges ever cause you to soil your bed ? A. " They used to cause dreams causing emissions." Q. But to soil your bed with faeces or urine ? A. " No, just reproductive fluid." (*Note.*—There is no clearly marked ultraparadoxical phase in the excretory system judging by these answers.)

Pathophysiological point.—Q. Did you want to get away from the people who caused these charges ? A. " Yes." Q. Why ? A. " It is very annoying people listening in to your brain and tampering with your body." Q. How did they tamper with your body ? A. " Playing with the different organs of your body and muscles." (*Note.*—I.e., glands and muscles or effector system.) Q. Could you say exactly what you mean by " playing " ? A. " Improve the action or retard it."

Nutritional system.—Q. Those people used to annoy you when you are eating. Did they want you to think your food was poisoned ? A. " No, not poisoned—just dirty with things off the floor and matter from other people's bodies." Q. What kind of matter ? A. " Bowel matter or other people's saliva." (*Note.*—The admixture of negative effects with positive is clearly shown.)

Pathophysiological point.—Q. Did you ever want to attack those people who caused the charges ? A. " Yes, you felt like doing them harm." Q. Do you think it would have helped your brain to have got them out of the way ? A. " Yes, you would be relieved very much." Q. You told me you had impulses to hurt yourself ? A. " You get the impression that you would be better off with a natural hurt, like

clawing your face or biting your hand." (*Note.*—The need to attack persons, including himself, is indicated, and this patient actually injured himself in the above manner.)

Analysis.—Since it is people who are attacked or avoided in this case, the opinion may be stated that the nervous system of this patient functions abnormally because people (in so far as they are conditioned signals which have been combined in some formation which is pathogenic) become the factor constituting a nervous strain. Such signals induce the abnormal phases in the remainder of the cerebral cortex, and evidence of this appears as abnormal behaviour responses. People thus do interfere with his normal functioning, and that he believes this influence to be "electrical" is merely an expression of its power over him, his inability to understand its true nature and his fear of it.

6. Discussion.

It may be truly said that contemporary psychiatry has been stirred by the striking successes in methods of physical treatment. Sargant and Slater (4) express this well in the first sentence of their well-known book—"It is a remarkable fact that, despite the popular notion that psychotherapy is the only method of treatment of psychological conditions, most of the big advances in psychiatric therapy have been along somatic lines." It is significant that they also give a quotation from the Goulstonian Lectures of 1870 given by Henry Maudsley, who surely expresses the beliefs of another generation when psychiatry in this country was undergoing vigorous change—"The observation and classification of mental disorders have been so exclusively psychological that we have not sincerely realized the fact that they illustrate the same pathological principles as other diseases, are produced in the same way, and must be investigated in the same spirit of positive research. Until this is done I see no hope of improvement in our knowledge of them, and no use in multiplying books about them." We, to-day, are indebted to this generation for elevating the care of the mentally ill to an unprecedented level of humanity and efficiency, and for advancing our knowledge of the physiology, anatomy and pathology of the nervous system which elucidated the nature of such mental diseases as are recognized now to be of nutritional, organismal, toxic, endocrinal and traumatic origin.

There is no question of psychiatry finishing up where it began, however, because, side by side with that old and new knowledge of soma there grew up a vast body of collected facts and more or less accepted theory—the product of the parallel development of psychology which to-day comprises many schools. Psychiatry has been greatly enriched by the development of psychology, and has in turn, by its own contributions, repaid its sister science.

From time to time, we feel constrained to take stock of new knowledge of soma and psyche and venture to form new hypotheses on this age-old mind-body problem. The present day is such a time for, with the increasing interest in psychosomatic medicine and the broad biological outlooks that are felt to be necessary for full understanding of the medical sciences, the controversy has been thrust into the fore-ground of the contemporary scene. Monism, dualism, epiphenomenalism, psychophysical parallelism and other workable and unworkable compromises have their protagonists. It appears,

however, that the mind and body have to be one in the meantime—at least, if numbers determine such issues. This decision springs from the countless examples of interconnectedness of mind and body, familiar to all students of humanity. Perhaps our knowledge is inadequate, however, for final decisions. There is still a need for a further parallel development of physical and psychological approaches with profit to both, and if it can be found in what way or ways mind and body are interconnected or are one, a great step forward will have been taken.

The problem of consciousness or mind has been avoided in this paper, which is more concerned with behaviour and the intraneural processes which are believed to accompany it. It has been our aim to observe animal and human behaviour in normal and abnormal function and to detect fundamental parallels. These are so striking in our view that it is felt that they demonstrate a certain degree of identity of functions between the nervous systems of animals and of man, especially in the lower instinctual functions.

It is interesting to note the convergence of physiological and psychological views on interpersonal relationships. For example, the stimuli constituting the mother-object in the child's nervous system and oral stimulation precede both the arousal of the nutritional reflexes and the infantile sexual reflexes. Again, the stages in the development of the sexual differential system are strikingly like accepted systems of psychosexual development. While it would be false to maintain that we are dealing with identical matters, nevertheless, we feel that they are significantly related. In so far as ambivalence to persons manifests itself in behaviour, we again observe similar conduct in animals with induced neuroses. This observation is admittedly a bold one but the implications are interesting, for the isolation of an ambivalent behaviour pattern in taking a clinical history can form the clue to the root cause of the disorder. For example, if the behaviour of a patient shows aggression towards or avoidance of another person (such as parent or spouse) upon whom there is instinctual dependence, then we can say they (as stimuli) are the source of the nervous dysfunction. In this way abnormal behaviour assumes a certain rationality, or at least has utilitarian value for the subject, since it removes the source of trouble (if he destroys or chases people away) or removes him from the trouble (if he avoids people).

These interesting parallels between appearances in clinical psychiatry and experimental pathophysiology have the important implication that a great mass of physiological work which at present is considered rather of the " pure science " category becomes relevant for psychiatry. The known ways of disrupting normal nervous function in animals afford a method of isolating the etiological factors in mental disorders, and the specific knowledge thus acquired suggests a prospect of *specific* physical methods of treatment which would help to reconcile the divergent schools of psychiatric thought.

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NORMAL CHANGES IN THE MENTAL ABILITIES OF ADULTS AS AGE ADVANCES.

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I. Introduction.

It is generally recognized that the capacity to grasp new ideas and learn new methods of work depends partly upon a person's intelligence and partly upon his age. It is also recognized that over-taxing a person's capacity to acquire new methods of work, or inadequate opportunities for a person to develop the capacity he possesses, are sources of dissatisfaction, mental strain, and sometimes physical complaints amongst normally healthy people. There is even reason to believe that amongst less healthy people they contribute towards disaffection and illness.

During 1944–45 the G.P.O. Engineering Department, Scotland, and Messrs. ———, Ltd., London, asked permission to use mental tests which they thought would assist them to select, in economic proportions, suitable staff to meet the requirements of their organizations. These requests opened a matter of considerable psychological interest. The G.P.O. Telephone Service and Messrs. ———, Ltd., are branches of industry requiring men capable of acquiring specialized training. The greater part of the staff of each is recruited in youth, and remains in the same organization until the retiring age of 60 to 65. The chief difference between them is that one is a national monopoly, the other a competitive industry. The two requests therefore offered a unique opportunity for a comparative study of the distribution of mental ability in a competitive and non-competitive industry, and for assessing, with considerable accuracy, normal changes in mental ability with age.

For these reasons the Crichton Royal Department of Psychological Research asked the G.P.O. Headquarters and the Directors of Messrs. ———, Ltd., for their co-operation in an investigation designed to provide information concerning the assessment of general trainability and normal variations of this ability with age. The requests received the support of the administrative and staff sides of each organization, and in 1946 a plan for two exactly parallel surveys was put into operation.

The agreed object was :

(*a*) For the organizations co-operating to obtain information concerning methods which would assist them in recruiting the right kind of staff in the right proportions without making excessive demands upon people not naturally equipped to meet them, and without training men of good ability in such numbers that their chances of promotion would be unduly delayed. This aspect of the investigation is reported elsewhere (1).

(*b*) For the Crichton Royal to obtain information concerning normal changes in the intellectual abilities of adults as age advances, and statistical

data which would contribute towards standardizing the tests they wished to use.

II. The Men Tested.

At meetings with the staff of each organization the reasons for the investigation were explained to the men. To secure their co-operation, even if they thought they were less able than other men, it was also explained that a method would be used whereby those volunteering to do the tests need not put their names on their test papers. Information concerning each person's age, year of entering, grade of occupation on entry and present work was provided for the entire male staff of each organization. This information was coded and recorded in advance on each volunteer's test record form. In this way it was possible to classify the men according to the kinds of work in which they were engaged, and to compare the men tested with the remainder of the staff in their own organization, and with men engaged in any other occupation (1).

Table I shows, for each five-year age group between 15 and 65, the number and percentage of men in each organization who did the tests, and the relative size of each age group in the sample. As age advances there is seen to be a slight decline in the percentage of people who volunteered. Minor fluctuations in one organization are in most cases offset by fluctuations in the other, except for the group of men over 60 years of age. For both organizations this group is too small to be considered adequate. The engineers show an unusually high proportion of men in their 30's. Table II shows the number and percentage in each occupational group who did the tests, and thence the degree

Table I.—*Distribution of Volunteers According to Age.*

Age group.	G.P.O. Engineers.			Messrs. —— Ltd., male employees		
	Number tested.	Percentage of staff.	Percentage of sample.	Number tested.	Percentage of staff.	Percentage of sample.
15–19 years	91	55	9	78	30	8
20–24 ,,	88	53	8	52	27	6
25–29 ,,	151	45	14	114	36	12
30–34 ,,	231	45	22	128	32	14
35–39 ,,	162	38	15	122	30	13
40–44 ,,	90	40	9	144	30	16
45–49 ,,	87	39	8	116	30	12
50–54 ,,	85	51	8	70	24	8
55–59 ,,	49	32	5	67	35	7
60–64 ,,	13	23	1	29	18	3

Table II.—*Distribution of Volunteers According to Occupational Group.*

Occupational group.	G.P.O. Engineers.			Messrs. —— Ltd., male employees.		
	Number tested.	Percentage of staff.	Percentage of sample.	Number tested.	Percentage of staff.	Percentage of sample.
Directive or executive	85	57	8	34	32	4
Workmen (highly skilled)	234	48	22	159	34	17
Workmen (skilled)	328	40	32	242	32	26
Workmen (qualified)	296	39	28	240	34	26
Unskilled workmen	54	39	5	153	20	16
Youths-in-training without skilled date	50	52	5	63	40	7
Unclassified assistants, etc.	—	—	—	29	22	3

TABLE III.—*Distribution of Volunteers According to Method of Entry.*

Occupational grade.	G.P.O. Engineers.			Messrs. —— Ltd., male employees.		
	Number tested.	Percentage of staff.	Percentage of sample.	Number tested.	Percentage of staff.	Percentage of sample.
Youths	359	49	34	101	34	11
Unskilled workmen	384	38	37	520	27	57
Skilled workmen	266	43	25	262	33	28
Academically trained men	38	51	4	37	39	4

TABLE IV.—*Present Ages of Staff Recruited as Youths.*

Present age.	G.P.O. Engineers.		Messrs. —— Ltd., male employees.	
	Number tested.	Percentage of total staff.	Number tested.	Percentage of total staff.
16–19 years	85	57	27	26
20–24 ,,	79	53	24	41
25–29 ,,	95	45	21	35
30–34 ,,	22	55	13	33
35–39 ,,	12	33	11	65
40–44 ,,	9	26	1	—
45–49 ,,	34	53	3	—
50–54 ,,	23	53	—	—
55–59 ,,	—	—	1	—

TABLE V.—*Age at, and Year of Entry of Staff Recruited as Unskilled Workmen.*

G.P.O. Engineers:

Year of entry.	Age of entry in years.										Total for year of entry.
	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	
1902–06	1	—	—	—	—	—	—	—	—	—	1
1907–11	7	2	—	—	—	—	—	—	—	—	9
1912–16	2	9	4	—	—	—	—	—	—	—	15
1917–21	—	9	7	1	1	—	—	—	—	—	18
1922–26	—	6	13	4	2	—	—	—	—	—	25
1927–31	—	2	4	1	2	—	—	—	—	—	9
1932–36	1	54	55	28	11	5	—	—	—	—	154
1937–41	1	43	25	17	7	4	6	5	—	1	109
1942–46	—	5	10	14	5	1	1	5	—	3	44
Total for age of entry	12	130	118	65	28	10	7	10	—	4	384

Messrs. ——, Ltd., Male Employees:

1902–06	2	—	—	—	—	—	—	—	—	—	2
1907–11	5	3	—	—	—	—	—	—	—	—	8
1912–16	7	3	2	2	—	—	—	—	—	—	14
1917–21	5	6	2	3	2	—	—	—	—	—	18
1922–26	10	9	7	—	2	1	—	—	—	—	29
1927–31	25	19	13	7	5	1	1	—	—	—	71
1932–36	34	19	19	18	5	1	—	—	—	—	96
1937–41	51	19	16	19	9	19	20	9	..	2	164
1942–46	50	4	10	9	10	12	8	9	5	1	118
Total for age of entry	189	82	69	58	33	34	29	18	5	3	520

to which each sample can be regarded as a representative cross-section of the entire organization. Table III shows, for the men co-operating, the numbers who entered each organization as boys, as unskilled or as skilled workmen, and as men with technical or University qualifications. Table IV shows the present ages of the men who entered each organization as boys. Amongst the engineers, some of these are now over 50 years of age. For Messrs. ——, Ltd., the group is much smaller; at present they are nearly all under 40 years

TABLE VI.—*Age at, and Year of Entry of Staff Recruited as Skilled Workmen.*

G.P.O. Engineers:

Year of entry.	Age of entry in years.										Total for year of entry.
	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	
1902–06	1	—	—	—	—	—	—	—	—	—	1
1907–11	2	1	—	—	—	—	—	—	—	—	3
1912–16	5	8	6	2	—	—	—	—	—	—	21
1917–21	—	1	—	—	—	—	—	—	—	—	1
1922–26	—	6	2	1	—	—	—	—	—	—	9
1927–31	—	2	1	—	1	—	—	—	—	—	4
1932–36	2	31	16	10	5	2	1	—	—	—	67
1937–41	2	51	45	19	4	—	1	—	—	—	122
1942–46	—	1	12	16	6	2	1	—	—	—	38
Total for age of entry	12	101	82	48	16	4	3	—	—	—	266

Messrs. —— Ltd., Male Employees:

1902–06	2	—	—	—	—	—	—	—	—	—	2
1907–11	—	1	2	—	—	—	—	—	—	—	3
1912–16	2	3	5	—	—	—	—	—	—	—	10
1917–21	3	2	3	3	—	—	—	—	—	—	11
1922–26	6	12	3	4	4	—	—	—	—	—	29
1927–31	1	11	16	5	6	5	1	—	—	—	45
1932–36	1	10	17	7	6	2	—	1	1	1	46
1937–41	3	17	14	16	9	8	8	—	—	—	75
1942–46	—	6	5	10	5	8	3	3	1	—	41
Total for age of entry	18	62	65	45	30	23	12	4	2	1	262

of age. Table V shows, for the men entering each organization as unskilled workmen, the period during which they were taken on, and their ages at the time. Table VI gives a similar analysis of the men entering each organization as skilled workmen. From Table V it is seen that a high proportion of G.P.O. Engineers at present in their 30's were recruited as unskilled workmen during the slump period 1932–36. This was part of a Government policy to provide work for unemployed men. From Table VI it is seen that during the period 1937–41, the G.P.O. Engineering Department took on a high proportion of skilled workmen now in their 30's. During the period 1937–46 Messrs. ———, Ltd., took on a high proportion of unskilled workmen of all ages from 15 to over 60, a large proportion being boys under the age for military service.

III. THE TESTS USED.

The tests used were Progressive Matrices, 1938 (2), and the Mill Hill Vocabulary Scale, Form I (3). These two tests were constructed for use together in order to show in a distinct and clearly defined form (*a*) a person's present capacity for intellectual activity, and (*b*) the level of his present intellectual attainments relative to other people. Both tests had been standardized for children 6 to 14 years of age. The Matrices Test had also been standardized for men 20 to 25 years of age(4). The tests still needed to be standardized for older people.

Progressive Matrices (1938) is a non-verbal test of a person's capacity at the time of the test to form comparisons, reason by analogy, and develop a logical method of thinking regardless of previously acquired information.

TABLE VII.—*Re-test Reliability and Inter-Correlation of Progressive Matrices (1938), and the Mill Hill Vocabulary Scale, at Different Ages.*

Age range.	Number tested.	Matrices Test. First test. Mean score.	Matrices Test. Re-test reliability.	Vocabulary Test. First test. Mean score.	Vocabulary Test. First test.	Vocabulary Test. Re-test reliability.	Correlation between P.M. and M.H.V. scores.
Under 30	44	48	·93	41	15·7	·97	·60
30–40	104	37	·88	33	8·9	·91	·51
40–50	106	35	·87	31	9·0	·98	·45
50 and over	77	29	·83	31	12·1	·90	·44

In other words, it is a test of a person's capacity to understand and apply a fresh method of thinking. It is in no sense a test of any specific ability or aptitude, but it has repeatedly proved to be a valuable test of a person's normal capacity to learn any particular knowledge or technical skill he may desire to acquire.

The Mill Hill Vocabulary Scale is a test of the general fund of information a person has acquired as the result of intellectual activity in the past. It does not indicate what a person will in future be able to learn, but it provides one of the most satisfactory means of determining the best level of intellectual development a person has attained in the past, whatever his present capacity for intellectual activity may happen to be.

IV. Re-Test Reliability and Inter-correlation of the Tests.

During 1943 the two tests were given in their standard form without a time limit to 331 men of the Civil Defence Light Rescue Squads in North London. The men were re-tested a month later. Table VII summarizes the results. According to both tests, the men under 30 years of age are, as a group, more able than the rest. (The group contained a number of conscientious objectors.) For the men over 30 years of age, the mean Vocabulary Test score remains relatively constant. The mean Matrices score, on the other hand, declines noticeably. The Matrices re-test reliability is seen to decline also. One possibility is that low scores on the test are in themselves less reliable than high scores. It should, however, be noticed that the Vocabulary Test reliability also declines as age advances. Another possibility is that as a result of asking a person to choose right answers out of groups of alternatives, the lower his genuine score the greater the number of opportunities he has of choosing the right answers by chance alone. The same decline in reliability, however occurs when the definition half of the Vocabulary Test is considered by itself. Clinical work with the tests suggests that low re-test reliability and inter-correlation represent a genuine variability in the output of intellectual activity under certain conditions. Both tests show the highest re-test reliability and inter-correlation when they are given to healthy people 12 to 30 years of age. The lower re-test reliability and inter-correlation obtained when they are given to little children, old people, mental defectives, and people who are mentally ill, is probably due in part to chance factors, but more to a greater variability in the intellectual activities of such people. Whatever the explanation may be, it is clear that a distinction must be made between the results of unreliable tests and the test results of unreliable people.

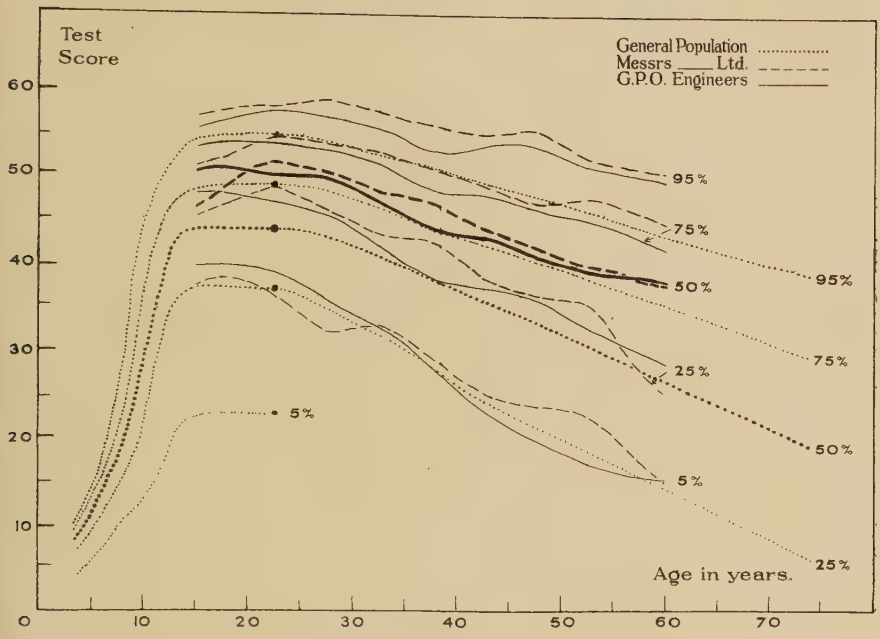
More accurate information concerning re-test reliability at different ages and the degree to which it represents genuine variability of mental output is urgently needed. This information could only be obtained from an investigation planned for the purpose. In the present investigation, to secure the co-operation of men of all ages, it was necessary to let those co-operating remain anonymous if they wished. As a result, it was not possible to re-test the men and investigate the psychological significance of differences between the first and second test results.

V. Variations in the Test Scores with Age.

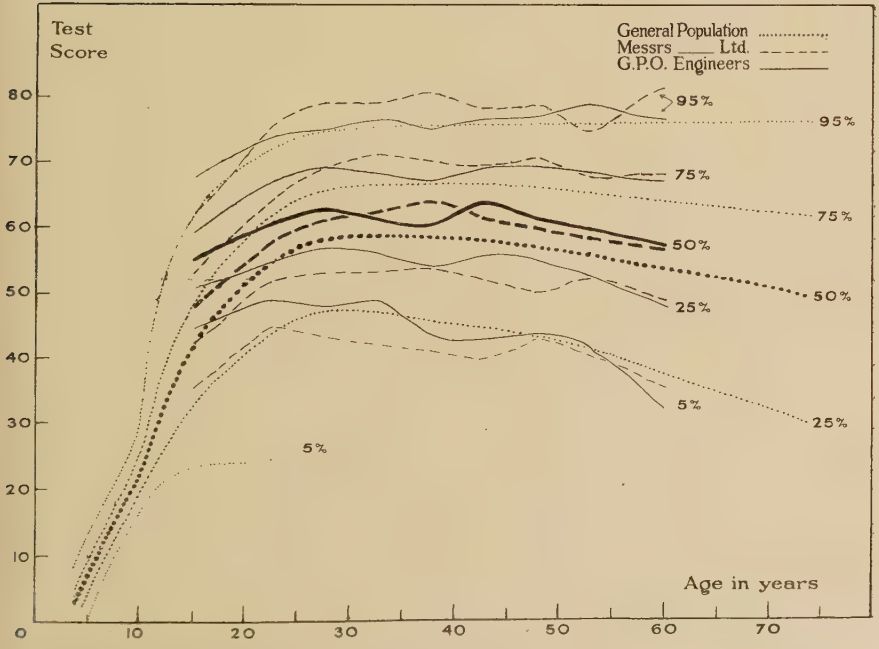
The selected men who agreed to do the tests attended at stated times, and were tested in groups of about 25 to 30. The tests were carried out between 9 a.m. and 4.30 pm., and were administered according to the standard procedure. No time limits were imposed. The times of beginning and ending each test were noted, and a quarter of an hour between each group was allowed, to minimize disturbances. The trends in the test results for the men entering each organization as boys, as unskilled and as skilled workmen were sufficiently alike to warrant combining the three groups in order to determine the general changes in the test scores with age.

In Graph I, changes in the Matrices Test scores between the ages of 17 and 60, for 1,047 G.P.O. Engineers, are compared with changes in the test scores for 920 male employees of Messrs. ———, Ltd. The 5th and 95th percentile curves indicate, for each organization, the neighbourhood of the upper and lower extremes of the score distributions. The 25th and 75th percentile curves indicate the extremes between which lie the scores obtained by 50 per cent., or the main body of the men. The 50th percentile curve indicates the median or central score for each group. With one or two exceptions the percentile curves for the two organizations show a surprising similarity. The 5th and 95th percentile curves are susceptible to chance variations in the groups considered. For the employees of Messrs. ———, Ltd., the 25th, 50th, and 75th percentile curves show a marked downward trend in the scores obtained by men under 25 years of age, but it has already been noted that during the past ten years they have been taking on an unusually large number of unskilled youths. Recently they have in fact been compelled to employ almost any boy who applied to them for work.

For G.P.O. Engineers in their 30's there is an accentuated decline in the average Matrices Test score. For the employees of Messrs. ———, Ltd., the exact opposite occurs. It has already been noticed that during the slump period, the G.P.O. Engineering Department intentionally took on a large number of young, unskilled workmen, who are now in their 30's. During this period Messrs. ———, Ltd., were able to select the best men from a large number of applicants. In the neighbourhood of 60 years there are less consistent variations in the percentile curves. This is probably due to the fact that the numbers of men tested were small. Apart from this, most of the fluctuations in the percentile curves for one organization are offset by opposite fluctuations in the percentile curves for the other organization. In



GRAPH I.—Variations in the progressive matrices test score.



GRAPH II.—Variations in the Mill Hill Vocabulary test score with age.

general, the rate of decline in the Matrices Test scores from the age of 25 onwards is seen to be surprisingly uniform, and to be independent of the particular kind of work in which the men are engaged, or the conditions of employment.

The Progressive Matrices had already been standardized for men 20 to 25 years of age (4). In order to standardize the test for adults over 25 years of age, it was therefore possible to start with the established percentile points for men 20 to 25 years of age, and exterpolate each in accordance with the observed mean rate of change at that score level at successive intervals of five years. As the large majority of the men in the two organizations proved to be of average, or more than average ability, the normal 95th to 50th percentile curves could in this way be established with considerable accuracy. With slightly less accuracy it was also possible to exterpolate the normal 25th percentile curve. The investigation, however, provided insufficient information for it to be possible to determine changes in the 5th percentile score after the age of 25. The dotted curves indicate the established Matrices percentile points for children, and for men 20 to 25 years of age. They also indicate what are inferred to be the normal changes between the ages of 25 to 60, and after this, if we assume that the changes continue uniformly.

Graph II shows, for each organization, variations in the Vocabulary Test score with age. Compared with the G.P.O. Engineers, the percentile curves for the employees of Messrs. ———, Ltd., show the same steep downward trend for men under 25 years of age, due to the fact that at the present time they have to take almost any boy who applies to them for work. They also show the same peak in the 30's compared with a drop in the scores for the Engineers, due to the fact that during the period 1932–36 the G.P.O. took on a large number of young, unskilled men, while Messrs. ———, Ltd., could select their staff from a large number of applicants. According to the median Vocabulary Test scores, the Engineers appear, as a group, just slightly more able than the employees of Messrs. ———, Ltd. According to the Matrices Test scores, they appear, as a group, just slightly the reverse. The difference may reflect a greater thoroughness of education in Scotland, or fewer outdoor leisure interests. Unlike the Matrices Test, the Vocabulary Test percentile curves show, for both organizations, a consistent rise in the scores up to about the age of 30. After this they remain practically constant up to the age of 60.

For the Vocabulary Test, the normal dispersion of scores for men between 20 and 25 years of age was not already known. In order to fix the chief percentile points at maturity, a pool was therefore made of all the available test records for normally healthy men 17 to 30 years of age, obtained in this and other investigations. To this was added a group of test records for men of similar ages, but known to be definitely below the average in intellectual ability. From this pool records were drawn until at the average age of 20 and 25, two populations were built up in such a way that for each age group the Matrices Test scores were distributed in agreement with the distribution obtained from Militiamen in 1941 (4). The Vocabulary Test scores for each population were subsequently used to compute the normal percentile distribution at 20 and at 25. The chief percentile points obtained for men age 20 $\pm$ 3 years, and men aged 25 $\pm$ 5 years, are shown in Table VIII. Unlike

TABLE VIII.—*Mill Hill Vocabulary Scale Percentile Points Calculated for a Normalized Sample of* 156 *Men* 20 ± 3 *years, and* 268 *Men* 25 ± 5 *years.*

Percentile points.	Average age.	
	20.	25
95	71	74
90	65	72
75	59	66
50	**51**	**58**
25	39	48
10	27	33
5	22	26

the scores obtained with the Matrices Test, there is a noticeable increase in the Vocabulary Test scores after the age of 20. The increase is relatively uniform throughout the distribution, and suggests that the normalized samples used are moderately consistent. With the normal Vocabulary Test percentile points at least tentatively established for men 20 to 25 years of age, it was possible to exterpolate the 25th to 95th percentile points up to the age of 60, in the same way as it was possible to exterpolate them for the Matrices Test scores.

VI. Inferences Concerning Normal Changes in Mental Ability with Age.

According to Graph I, the capacity to form comparisons and reason by analogy increases rapidly during childhood, appears to reach its maximum somewhere about the age of 14, after which it remains relatively constant until from about the age of 25 onwards it slowly declines. If the decline continues at a similar rate after the age of 60, it would appear that by the age of about 80, the average person's capacity to grasp fresh ideas and adopt new methods of working has ceased to be greater than that of a child of eight. This is important in view of the fact that before the age of 8 years the average child is incapable of forming abstract comparisons and reasoning by analogy, at least as a systematic method of learning. According to Graph I this would appear to apply equally well to old people. This is interesting as, in work carried out with seniles (5), it has already been found that old people can only understand the test at all if it is given to them in the form of boards and moveable pieces, just as one would give the test to a little child, and that when it is given to them in this form, it is one of the very few tests which they can understand and carry out at all effectively.

According to Graph II, the average person's ability to recall information normally increases up to the age of at least 25, and from about the age of 30 onwards remains relatively constant for about 25 years, after which it apparently declines a little. For people above the average, ability to recall information apparently continues to increase slowly even up to the age of 60. For people below the average the opposite appears to be the case. What ability they acquire in youth appears to decline fairly early in life.

With minor exceptions, the findings are in agreement with the findings of other investigators (6, 7, 8, 9). They are also in agreement with the generally

accepted view that from about the age of 30 onwards a person's ability to understand new methods of thinking, adopt new methods of working, and even to adjust to new situations, steadily decreases, whereas he is normally able to recall acquired information long after his capacity to adapt to new situations has begun to decline. The findings also support the view that a Vocabulary Test gives an index of the best level to which an individual has attained, whatever his present capacity for intellectual activity may be (10).

We still need more accurate information concerning normal changes with age occurring amongst people definitely below the average in intellectual capacity, and more representative groups of test records for people 15 to 30 years of age. Information is also needed concerning the normal changes after the age of 60. At present there is inadequate information concerning changes in the re-test reliability with age, and the degree to which they indicate increased variability of mental output as distinct from the unreliability of the test score in itself. Investigations so far completed, however, provide us with considerable information concerning normal changes in the test scores of adults of average, or more than average, intellectual capacity, and it is anticipated that subsequent investigations will fill at least some of the gaps in our present knowledge.

Acknowledgments.

Thanks are due to Dr. P. K. McCowan and the Directors of The Crichton Royal for making the necessary Research Staff available; to the Regional Director and Officials of the Post Office in Scotland, and to the Directors and Staff of Messrs. ———, Ltd., London, for providing the necessary information and facilities for the investigation. Thanks are also due to the men in each organization who volunteered to do the tests. It is only as a result of such joint co-operation that an investigation of this kind is possible. Comparable data drawn from different branches of industry, and from the fields of Education, Health and Public Administration, is vital to basic psychological research, and to co-operative social welfare. It is hoped that the present comparative study will be the first of others equally gratifying to report.

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THE PLACE OF PSYCHIATRY IN MEDICINE.*

By Noel Harris, M.D., F.R.C.P.

I wish to make it clear at once that for the purpose of this paper I am taking the definition of psychiatry as being synonymous with the term psychological medicine—in other words, the study of the subject as a whole.

The place of psychiatry in general medicine can be considered from two angles : (1) In what way can the health of the individual patient be improved both prophylactically and therapeutically by a greater understanding of that individual's psychological make-up, and (2) whether there are any specific factors which have arisen or are likely to arise from a knowledge of psychiatry which increases our knowledge of the aetiology and pathology of general disease ?

I am going to deal with the first point comparatively briefly, not because I do not feel strongly about the importance of it, but because I want to concentrate this morning on the second aspect.

Nearly everyone agrees that the study of the individual is important, but it is extraordinary how many people fail to put it into practice.

In any organic illness the patient's individual emotional reaction to that illness does affect his total state of health, and this should be considered. Broadly speaking the more synthesized a person's character, the more is he able to "cope" with or adjust himself to any organic illness which he may develop. The greater the neuropathic tendencies in an individual, the more is he or she likely to make a fuss and poor adjustment to his physical illness, but surely that is no excuse for a doctor getting impatient with or critical of a patient. The doctor's duty is to cure the patient as a whole, and therefore if, instead of regarding the patient who is difficult in his reaction to the illness as another "headache," he regards the attitude of the patient as a complication of or sort of secondary illness to be diagnosed and treated just as the primary physical illness, then that unfortunate element of friction that may arise between doctor and patient will rarely do so, and I believe the doctor will find a greater interest rather than irritation in that individual patient. Moreover, everyone of us should try to remember that our attitude towards functional illness is often not a rational objective, but a projection of our own emotional disturbance. So often when dealing with psychological disorders we feel ignorant of the real facts, and certainly ignorant of how to cure the patient's troubles, therefore we feel frustrated and project that sense of frustration on the patient.

I well remember an occasion at home when I was criticizing some of the tests which were being used in a certain section of the Army at that time,

* A paper read at the Discussion on the Place of Psychiatry in Medicine at the Annual Meeting of the Royal Medico-Psychological Association at Eastbourne, 12 July, 1947.

until it was pointed out to me that the tests I was criticizing most hotly were the tests I could not do myself.

Another point to remember is that sometimes we do patients harm by ordering repeated physical examinations and investigations in a manner that suggests we almost want to avoid making a diagnosis of nervous disorder. It was a real pleasure to hear in the Presidential Address the need for education mentioned. It is of infinite importance, not only for the medical profession but also the public, to realize how our emotional life does affect our physical state.

Of course I realize how trying the neurotic patient can be, and there is nothing more important than a balanced view-point and sense of humour in considering these matters. It is a fact, however, that if one learns to regard a patient's querulous or trying behaviour as a symptom in themselves, something which can be explained and often put right, one's own sense of annoyance at the patient's behaviour is lessened in the interest of finding out why the patient behaves in such a manner. The only way to stimulate medical men's interest in the problem is to start teaching them normal psychology, to give them a realization that a great deal can be learnt as to why people do feel and act in any particular manner. There are few more fascinating studies than human behaviour when once the subject is broached.

The study of the patient as an individual leads on to the study of the patient *en masse*, and, without in any way detracting from the importance of the splendid work that has been done in public health, I would suggest that psychiatry has made and is making the main contribution in the progress of social medicine to-day, and this is clearly a part of general medicine. The increasing importance of all those matters which are included under the term "social medicine" have been brought to the surface and stressed very largely through the increasing influence and knowledge of psychological factors.

Consider also health in industry. Statistics show that a very high percentage of hours lost through sickness in industry result from so-called functional illness rather than pure physical illness. Comparatively scant attention has been given to this matter until recently. The old diagnoses of nervous debility, neurasthenia or nervous dyspepsia were allowed to go unchallenged. It is largely through an increasing knowledge of psychiatry applied to medicine that the importance of studying the conditions under which people work, the suitability of persons for a particular job, personnel selection and many other factors have been brought to the fore. Another point that should be mentioned which is of great prophylactic importance is what I will term broadly marital hygiene. The amount of unhappiness, and at any rate minor, if not major, ill-health which results from marital disharmony is hardly realized, but statistics so far as they go would point to it being very high, and many gynaecologists and general practitioners must be faced with this fact. In this realm it is psychiatry again that has led to an appreciation of the need for more study and treatment. I hope that I have said enough to prove my first point, though much more could be said.

We now come to what specific contribution psychiatry has made to our understanding of the aetiology and pathology of disease.

The diagnostic label "nerves" or "nervous" has been attached to many conditions by all members of the profession, often unfortunately with an indication of slight scorn, and also more unfortunately in such a way as to give the patient the impression that the term means some physical disturbance of material nerve structure. Many a patient who has been told that he has nervous dyspepsia gets a sort of mind picture of the nerves supplying the stomach wall being like red-hot wires—something physical—and it cannot be emphasized too strongly that all the evidence goes to show that it is a disturbance of the *emotional* life of the person which is causing the illness.

Many workers have already drawn attention to the importance of emotional disturbance in certain well-recognized physical illnesses, for instance, gastric and duodenal ulcers, Graves' disease, colitis, and more recently in certain skin diseases and diseases of muscles and joints. It is accepted by all that emotional disturbance does produce a physical reaction. The effects of fear in producing tachycardia, tremors and sweating are common to all.

The whole realm of psycho-somatic medicine is beginning to come into the field of general medicine, and it is perhaps in this particular sphere that psychiatry can make its greatest contribution.

On going through the literature, it is clear that a high percentage of medical men realize the importance of emotional factors in causing gastric and duodenal ulcers. Harvey Cushing made this clear in a paper published in 1932.* There is still much argument as to the details of how the ulcer is produced, and it is probable that there is some constitutional factor in the individual which predisposes him to ulcers, but, even so, if that person can be kept free from a state of emotional tension, there is every likelihood that an ulcer will not develop. Moreover, it is worthy of consideration whether the constitutional factor which predisposes him to ulcer formation may not be similar in some way to the constitutional factor which possibly predisposes him to emotional tension, for there seems to be a group of people who generate anxiety in themselves as a dynamo generates electricity, and even much psychotherapy and insight fails to stop them generating this anxiety.

Increasing attention has been paid to emotional factors in the production of muscular and joint disturbances. Flind and Barber† describe a number of service patients who were seen on account of pain and symptoms which might be placed in that loosely used diagnostic category of "chronic rheumatism or fibrositis." They considered that the most important fact in all these patients was the psychogenic one. On the other hand, Kelly,‡ in an article in *Rheumatism*, disputes some of these interpretations, and points out that while he is sympathetic to the psychogenic factor, there may be subtle physical factors not yet clearly understood causing the symptoms.

In a paper read before the last Annual Meeting of the Chartered Society of Physiotherapists and published in their journal§ I pointed out how emotional tension frequently leads to muscular tension, and that this may well make a muscle more prone to develop secondary physical disease quite apart from the

* *Surg. Gynaec. and Obst.*, **55**, 1, 1932.
† S. Flind and H. S. Barber, *Quart. J. Med.*, **14**, 57, 1945.
‡ Michael Kelly, *Rheumatism*, **3**, No. 3, 1946.
§ *J. Chartered Society of Physiotherapists*, January, 1947.

various symptoms which occur purely as a result of prolonged muscular tension. Since this paper a number of physiotherapists have told me of the increased number of patients they have had during the war in whom emotional factors seemed far more important than damp air-raid shelters and other physical factors.

It would be possible to give many other examples ranging over genito-urinary disease, cardiology and endocrinology, but there is not the time. Many interesting facts are related in Weiss and English's admirable book, *Psychosomatic Medicine.*

It can hardly be disputed, however, that an understanding of the mechanism by which emotional tension affects the physical state would advance our knowledge of both the aetiology and pathology of many disease processes, and would probably lead to a minor revolution in some forms of treatment. Research work in this is all important, and if successful would do more than anything else to show the place of psychiatry in general medicine.

During the war we were fortunate enough at Woodside Hospital, which is now amalgamated with the Middlesex Hospital, to have a case of extreme interest, and I believe of paramount importance. This case has been recorded by my colleague, Dr. Robert Moody.* In case there are some who have not seen the article, I will relate briefly the more important points. An officer, aged 35, who had been a regular soldier, but who had been invalided out for somnambulism before the 1939 war, was admitted because of this symptom of somnambulism, which started to interfere with his work after he had been re-called to the Colours in 1939. He was treated by so-called " narco-analysis," pentothal mostly being used.

On one occasion after an abreaction, during which he re-lived an incident which occurred more than ten years prior to the time of treatment, an incident in which his forearms had been tightly bound together, he developed on his forearms the complete marks caused by the ropes which had bound him. There was the sulcus where the ropes had " bitten in," with even the criss-cross of the strands and the slightly raised oedematous edge. This phenomenon seemed unbelievable at first, but fortunately for scientific purposes all the emotion attached to the incident was not exhausted, and the abreaction was repeated twice under test conditions and the marks photographed.

This stimulated our interest, and since then Moody has had other similar results with other patients. Edkins in a yet unpublished paper has described his use of different reagents in abreactive technique, his results leading him to think in terms of different " levels of reaction," which might well fit in with some of the basic teachings of Hughlings Jackson.

The interpretation of these results we hardly venture to attempt at present, though it is hoped to carry out further research in an attempt to explain these and similar phenomena at the Middlesex Hospital. It is certain, however, that these phenomena do occur, and that full understanding of them will surely mean that a real contribution has been made to general medicine.

These phenomena suggest that a psycho-somatic pattern, if I can coin such a phrase, is absorbed into some part of the total individual—I purposely avoid

* R. L. Moody, *Lancet*, 28 December, 1946, p. 934.

using the term unconscious. If the emotional part of the pattern is reproduced with partial or complete intellectual conscious recall of the original experience, then the physical structure of the body may be activated in such a way as to show all the signs of a trauma previously experienced. This leads to speculation as to whether certain physical manifestations, such as an ulcer, or some particular skin lesion, or mono-symptomatic pain, such as is seen in the facial area—the unsuccessfully treated cases of what was thought to be trigeminal neuralgia—may be the visible, somatic sign of some psycho-somatic pattern, the emotional part of which is still hidden away. If so, by what means can the emotional part of the pattern be located and released, and if this is done, will it cure the physical disturbance? Again, is there some middle course which can be adopted? The various means of dealing with autonomic imbalance at once come to mind, but few of these methods of treatment seem very satisfactory up to the present.

There are one or two observations which may stimulate interest and research in others which I would like to make. Why is it that in an anxiety state, particularly an acute attack, certain parts of the autonomic seem to be picked out in different people? Why does one person get tachycardia, sweating and tremors and no dyspeptic symptoms, while another person will get dyspeptic symptoms and no tachycardia?

Why is it that during abreaction certain people will get a recurrence of the actual signs of a physical injury which occurred during an incident long prior to treatment, while others will have an equally good emotional outburst yet develop no such physical signs? I think there is some evidence to suggest that those people who may develop such physical signs are people who dissociate comparatively easily. Now on what does dissociation depend? I am not at all sure that it is not a constitutional factor which determines whether a person dissociates easily or not, and if it is, then here again is a further approach into the realm of general medicine.

The explanation of these phenomena seems to lie in the intimate interrelationship of the autonomic nervous system with that part of our body which deals with emotional reaction, but research alone will elucidate these facts.

In conclusion, I would maintain that no longer should psychological medicine be considered a subject apart from general medicine. It is not that psychiatrists wish to enlarge their own speciality; far from it. Much which is dealt with in the realm of psychological medicine should be taken over into the realm of general medicine, thus in a way making our own speciality a smaller matter to deal with.

Normal psychology should be taught as an essential approach to the understanding of health and disease. General physicians and surgeons knowing their normal psychology should deal with a lot of the cases which now may get turned over to an already overcrowded psychiatric out-patients' department. Perhaps most important of all, research work with a team of workers, working in harmony and co-operation, should push ahead with the blending of this whole matter, and the work should be carried out not only in the mental hospitals, but in general hospitals as well, for it is part—an essential part—of general medicine.

Part II.—Review.

Handbook of Correctional Psychology. Edited by ROBERT M. LINDER, Ph.D., and ROBERT V. SELIGER, M.D. New York: Philosophical Library. Pp. 691. Price $10.00

Forty-six authors—psychiatrists, neurologists, psychotherapists, surgeons and public health officials—contribute the forty-seven articles in this book. It is intended as a guide for prison physicians, psychiatrists, social workers, administrators and custodians in correctional work, and to indicate the way to improved measures of rehabilitation in detention and custodial institutions. The approach is essentially practical, but theoretical points of view receive consideration. Since the book endeavours to interest readers whose knowledge and training varies, it is almost inevitable that some of the articles will appear elementary to psychiatrists and prison physicians, whilst others dealing with, say, the use of electroencephalography in penal practice, or that on sugar metabolism in relation to criminology, may be outside the concern of those without medical experience.

A few articles deal almost exclusively with matters of general medical or surgical interest, and the inclusion of an account of a venereal disease programme in prison is unexpected in a book on correctional psychology.

Here and there over-elaboration is apparent, and occasionally over-simplification. But the articles are generally well balanced, lucidly expressed, and easy to read. Many are written by psychiatrists and others whose names are well known and respected in Great Britain. A useful bibliography is appended to many with advantage.

Considered as a summary of current American opinion, the book is assured of a place on the shelves of those who wish to obtain a closer understanding of the law-breaker and the medical methods which may assist in his rehabilitation.

W. NORWOOD EAST.

Part III.—Bibliography and Epitome.*

An attempt is being made to provide as far as possible a complete bibliography compiled from journals dealing with Psychiatry and Neurology (which are really inseparable) and their ancillary subjects, psychology, anatomy of the nervous system, criminology, etc.

If any reader can add the names of journals to the following list, which it is hoped to publish each year in the January number, the addition will be gratefully received and acknowledged.

Those journals which are available in the Library of the Royal Medico-Psychological Association are marked " 1," those available in the Library of the Royal Society of Medicine are marked " 2," those in the Library of the British Psychological Society are marked " 3," and those in the Library of the British Medical Association are marked " 4."

The titles of these journals are mostly in the form given by the Board of Editors of Publications of the American Psychological Association, January, 1939. Contributors are requested to use the exact form given below.

PSYCHIATRIC JOURNALS.

2 *Abh. Neur. Psychiat.*
Abh. Psychother.
2 *Acta Española Neur. y Psiquiat.*
Acta Neurol., Naples.
2, 3, 4 *Acta Psychiat. et Neurol., Copenhagen.*
3 *Acta Psychol., Hague.*
Acta Psychol., Keijo.
Alg. Neder. Tijdschr. Wijsbegeert. Psychol.
Aliéniste Français.
2 *Allg. Ztschr. f. Psychiat.*
Altersprobleme.
Am. Imago.
1, 2 *Am. J. ment. Def.*
1, 2, 3 *Am. J. Orthopsychiat.*
1, 2, 3, 4 *Am. J. Psychiat.*
2, 3 *Am. J. Psychol.*
Am. J. Psychotherap.
Am. Psychol.
An. Bras. Hig. Ment.
An. Istit. Psicol. Univ. B. Aires.
An. Psicotec., Rosario.
Anal. Inst. Neurol., Montevideo.
Analele Psihol. (Rumania).
Anales de psicol., Buenos A.
2, 3 *Année Psychol., Paris.*
2, 3 *Ann. Méd.-Psychol.*
2 *Ann. Osp. psichiatr., Perugia.*
Appl. Psychol. Monogr., Washington.
Arb. Psychiat. Inst., Sendai.

* A number of extracts in this section are reproduced from *Chemical Abstracts* and *Psychological Abstracts*. To the Editors of these two Journals we extend our grateful thanks.

Arch. Anthrop. crim.
2 *Arch. Argent. de Neurol.*
Arch. Argent. Psicol. norm. pat.
2 *Arch. Bras. de Neur. e Psiquiat.*
Arch. Brasil Hig. Ment.
Arch. Chilenos de Crim.
Arch. Ital. di Studi Neuropsich.
1, 2 *Arch. Neurobiol.*
Arch. Neurociv., Paraguay.
4 *Arch. Neurol., Paris.*
2 *Arch. de Neurol. de Bucarest.*
1 *Arch. de Neurol.*
2 *Arch. di Antropol. Crim.*
Arch. di Crim. Neuropsiquiat. y Disc. Con., Quito.
Arch. di Sci. Cereb. Psich., Salerno.
2, 4 *Arch. f. Psychiat.*
2, 3 *Arch. ges. Psychol.*
Arch. Internat. de Neurol.
Arch. Ital. Psicol.
Arch. Krim. Anthrop.
1, 2, 3, 4 *Arch. Neurol. Psychiat., Chicago.*
Arch. Neur. Psychiat., Mex.
2, 3 *Arch. Psicol., Neurol., Psichiat. e. Psicoter., Milan.*
2, 3 *Arch. Psychol., Genève.*
2, 3 *Arch. Psychol., N.Y.* (ceased publication 1945).
Arch. Relig. psychol.
Arch. Speech.
Arq. da Assist. a Psicop. de Pernambuco.
Arq. de Neuro-psiquiat., Brasil.
3 *Austr. J. Psychol. Phil., Sydney.*

Beih. Z. angew. Psychol.
Beih. Zbl. Psychother.
Bol. Inst. Psiquiat., Rosario.
2, 3, 4 *Brain.*
3 *Brit. J. Educ. Psychol.*
2, 4 *Brit. J. Inebriety* (now *Brit. J. Addiction*).
1, 2, 3, 4 *Brit. J. Med. Psychol.*
2, 3, 4 *Brit. J. Psychol.*
2, 3 *Brit. J. Psychol. Monogr. Suppl.*
Bull. Canad. Psychol. Ass.
2, 4 *Bull. de la Soc. de Psychiat. de Bucarest.*
2 *Bull. de la Soc. Roumaine Neur. Psychiat. Psychol. Endocrin.*
Bull. du Group. Franç. d'étud. de neuro-psychopath. infant.
2 *Bull. industr. Psychol., Melbourne.*
2 *Bull. Los Angeles Neur. Soc.*
2 *Bull. Menninger Clin.*
Bull. Milit. Clin. Psychol.
Bull. Soc. Psihol. med., Sibiu.

Canad. Journ. Occup. Ther.
Canad. J. Psychol., Toronto.
2, 3 *Cath. Univ. of Amer. Studies in Psychol. and Psychiat.*
2 *Cervello.*
2, 3 *Character and Per.* (now *J. Personality*).
2 *Child Develpm.*
2 *Child Develpm. Abstr.*
Child Develpm. Monogr.
Child Study.
Chin. J. Educ. Psychol., Chungking.
Chin. J. Psychol.
3 *Comp. Psychol. Monogr.*

2 *Confinia Neurol.*
Contr. del Lab. di Psichol.
Contr. Lab. Psicol., Milan.
Contr. psychol. Theor.
Criança Portuguesa.
Criminalia, Mexico.

2 *Deutsche Ztschr. f. Nervenh.*
2 *Dis. Nerv. Syst.*

3 *Educ. psychol. Measmt., Washington.*
Egypt. J. Psychôl., Cairo.
1, 2, 3, 4 *L'Encéphale.*
2 *Epilepsia.*
Evolut. Psychiat.

Fiziol. Th. S.S.S.R.
2 *Folia Neuropath. Esthon.*
2 *Folia Psychiat. et Neurol. Jap.*
2 *Fortsch. Neur. Psychiat.*

3 *Genet. Psychol. Monogr.*
Geriat., Minneapolis.
Giorn. di Psich. e di Neuropat.

Hum. Factor.
Hum. Relat., Cambridge, Mass.
2, 3, 4 *Hyg. Ment.*

Illinois Psychiat. J.
2 *Index Neurol. y Psiquiat., Buenos Aires.*
3 *Indian J. Psychol., Calcutta.*
Indiv. Psychol. Bull., Chicago
3 *Industr. Psychol.*
3 *Industr. Psychotech.*
1, 2, 3, 4 *Int. J. Psychoanal., London.*
2, 3 *Int. Z. Psychoanal. u. Imago.*

Jap. J. appl. Psychol.
Jap. J. Exp. Psychol.
Jap. J. Psychol.
1, 2, 3 *J. Abnorm. Soc. Psychol., Washington.*
J. Am. Soc. Psychic. Res.
3 *J. App. Psychol., Washington.*
2, 4 *J. Belge Neur. Psychiat.*
J. Child. Psychiat.
J. Clin. Psychol., Burlington.
2 *J. Clin. Psychopath., Montecello, N.Y.*
2 *J. Comp. Neur.*
1, 2, 3 *J. Comp. Psychol., Washington.*
J. Consult. Psychol., Washington.
J. Crim. Law and Criminol., Chicago.
2 *J. Crim. Psychopathol.* [now *J. Clin. Psychopath.*].
2 *J. de Psychiat. Infant* [now *Zeit. f. Kinderpsychiatrie*].
3 *J. Educ. Psychol., Baltimore.*
J. Except. Child.
3, 4 *J. Exp. Psychol., Washington.*
2 *J. f. Psychol. u. Neurol.*
3 *J. Gen. Psychol., Provincetown, Mass.*
2, 3 *J. Genet. Psychol., Provincetown, Mass.*
2 *J. Geront., St. Louis.*
J. Juvenile Res.

1, 2, 3, 4 *J. Ment. Sci., London.*
1, 2, 3 *J. Nerv. Ment. Dis., New York.*
1, 2, 3, 4 *J. Neurol. Neurosurg. Psychiat., London.*
J. Neuropath. and Psychiat., Leningrad.
1, 2 *J. Neuropath. Ex. Path.*
2, 4 *J. Neurophysiol.*
J. Neuropsychiat. du Pacifique.
2 *J. Neurosurg.*
3 *J. Parapsychol., Durham, D.C.*
2 *J. Personality, Durham, D.C.*
J. of Psychic. Res.
J. Psihoteh.
2 *J. Psycho-Asthen.* [now *Amer. J. Ment. Deficiency*].
1, 2, 3 *J. Psychol.*
J. Psychol., Moscou.
2, 3 *J. Psychol. Neurol., Leipzig.*
2 *J. Psychol. Norm. Path., Paris.*
J. Soc. for Psychic. Res.
3 *J. Soc. Psychol., Provincetown, Mass.*
2 *J. Speech Dis., Danville, Ill.*

Kriminal.
3 *Kwart. Psychol.*

Mag. psychol. Szle.
2 *Ment. Health, London.*
Ment. Health Obs.
2 *Ment. Hyg., N.Y.*
Ment. Hyg. Rev.
Ment. Hyg. Bull., Indiana.
3 *Mind, London.*
Mschr. Krim. Biol.
2 *Mschr. Psychiat. Neurol.*

Ned. Tijdschr. Psychol.
2 *Neopsichiat.*
2 *Nervenarzt.*
Nerv Child, New York.
3 *Neue psychol. Stud.*
2 *Neurbiol., Pernambuco.*
Neur. a Psychiat., Česká.
Nevrasse.
2 *Nevropath. i. Psikhiat.*
2 *Note e Riv. di Psichiat.*
Now. Psychjar.
Nuova Riv. di Clin. ed Assist. Psichiat.

Obshch. Klin. Nevropat.
2, 3 *Occup. Psychol., London.*
2 *Occup. Ther. and Rehabil.*
2 *Onder. Psychiat-Neur. Klin., Utrecht.*
2 *Osped. Psichiat.*

3 *Person. J.*
Pisani.
Polsk. Arch. Psychol.
Prace Psychol.
2 *Proc. Amer. Assoc. Stud. Ment. Def.* [now *Amer. J. Ment. Deficiency*].
2 *Proc. A. Res. Nerv. and Ment. Dis.*
3 *Proc. Soc. Psych. Res., London.*
Prog. Neurol., Psychiat.

3 *Psichotec.*
Psicoanalisi, Rome.
Psicoter., Cordoba.
Psyche, Cambs., Mass.
Psychiat. Monogr.
2 *Psychiat. en Neurol. Bl., Utrecht.*
2 *Psychiat. et Neurol. Jap.*
2 *Psychiat. Neurol. Wchnschr.*
2 *Psychiat., Washington.*
1, 2 *Psychiat. Quart., Utica, N.Y.*
2, 3 *Psychoanal. Quart., Albany, N.Y.*
2, 3 *Psychoanal Rev., New York.*
1, 2, 3 *Psychol. Abstr., Washington.*
1, 2, 3 *Psychol. Bull., Washington.*
Psychol. Clin.
Psychol. Exch.
3 *Psychol. Forsch.*
Psychol. Index.
2 *Psychol. Monogr., Washington.*
Psychol. Rec.
3, 4 *Psychol. Rev., Washington.*
3 *Psychol. Rev. Monogr.*
Psychol. Stud. Kbh.
Psychol. Stud. Univ. Bp.
Psychol. wychow.
3 *Psychomet., Chicago.*
Psychometr. Monogr.
2 *Psychosom. Med., New York.*
2 *Psychosom. Med. Monogr., New York.*

Quart. J. Speech.
2 *Quart. J. Stud. Alc., New Haven, Conn.*
2 *Quart. Rev. Psychiat. Neur., Washington.*

Rass. Neurol. Veget., Firenze.
Rass. Neuropsichiat. Sci. Aff., Salerno.
Rass. Studi Psichiat.
Rev. Argent. Neurol. Psiquiat.
Rev. de Psicoanal., Argentina.
Rev. di Neur. e Psychiat., S. Paolo.
Rev. di Psiquiat., Chile.
Rev. di Psiquiat. y Crim.
Rev. Espan. de Oto-neuro-oftam. y Neurocir.
3 *Rev. Franç. Psychoanal.*
Rev. Ibero-Amer. de Anal. Biblio. de Neurol. y Psiquiat.
Rev. Mex. Neurol. Psiquiat. y Med. Legal., Mexico.
1, 2, 4 *Rev. Neurol.*
2 *Rev. Neurol. de Buenos-Aires.*
Rev. Neurol. Psychiat., Praha.
2 *Rev. Neuro-Psiquiatr., Lima.*
2 *Rev. Oto-Neur.-Oftal. Cir. Neur. Sud-Am.*
Rev. Neuropsiquiatr.
Rev. Psicol. Gen. y Aplic., Madrid.
Rev. Psicol. Pädag.
Rev. Psicoanal., B. Aires.
3 *Rev. Psihol.*
Rev. Psihol. Icor. Aplic., Sibiu.
2 *Rev. Psiquiat. Crim., B. Aires.*
Rev. Psiquiat., Uruguay.
Rev. Psiquiat. y Disc. Con., Chile.
Rev. Psychol., Montreal.
Rev. Sudam. Psicol. Pedag.

Rev. Tchèque de Neurol. et de Psychiat.
Ric. Psich.
2, 3, 4 *Riv. di Neurol.*
Riv. di Neuro-psiquiat., Peru.
3 *Riv. di Psichol.*
Riv. Ital. di Endocrin. e Neurochir.
2 *Riv. Patol. nerv. ment.*
Riv. Psichol. Norm. Pat., Ferrara.
2, 4 *Riv. Sper. Freniat.*
1 *Rocz. Psychjat.*
2 *Rorschach Res. Exch., New York.*

1 *Schizofrenie.*
2 *Schweiz. Arch. Neurol. Psychiat.*
Schweiz. Z. Psychol.
Schweiz. Z. Psychol. Anwend., Bern.
Skand. Arch. Psychol.
Sovet. nervropatol., psichiatri, psichoguoguia.
Sovet. Psichoneurol.
Sovet. Psikhotekh.
Speech Monogr.

Tohoku Psychol. Folia.
2 *Tr. Am. Neurol. A.*
Tr. Beritov Inst., Tiflis.
Tr. Kostchenko Ment. Hosp., Moscow.
2 *Trud. fiziol. Lab. Pavlova.*
Trud. tsentral. psikhonevrol. Inst.

Univ. Calif. Publ. Psychol.
Univ. Iowa Stud. Psychol.
Untersuch. Psychol. Phil.

3 *Z. angew. Psychol.*
Z. Arb. Psychol.
Z. Berufs. des Pflegepers.
Z. Individ. Psychol.
2, 4 *Z. ges. Neurol. Psychiat.*
2 *Z. Kinderpsychiat., Basle.*
3 *Z. Pädag. Psychol.*
Z. Parapsychol.
2 *Z. Psych. Hyg.*
Z. Psychoanalyse, Tokyo.
3 *Z. psychoanal. pädag.*
2, 3 *Z. Psychol.*
Z. Psychother. med. Psychol.
Z. Tierspsychol.
2 *Zbl. Neurochir.*
1, 2 *Zbl. ges. Neurol. Psychiat.*
Zbl. Psychotherap.

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The Serial Sevens Test as a Psychometric Instrument.

By virtue of the frequency with which the Serial Sevens Test has recently been used as an instrument for the rapid screening of mental defectives, the present study has endeavoured to study the relationship between performances of 201 white and 77 negro adult males on the Bellevue-Wechsler (Verbal) Scale of Adult Intelligence (10) and the Continuous-Subtraction examination (7). These men

ranged in age from 17 to 24 and revealed tested intelligence quotients ranging from 47 to 94. These two samplings, negroes and whites, were selected for study only after psychiatric examinations had revealed the existence of no marked neurological and personality disorders. On the basis of the results obtained here and those reported earlier by other investigators the following concluding statements are made :

(1) For all population samplings reported thus far a low positive coefficient of correlation exists between performance scores earned on a standardized test of general intelligence and the Serial Sevens Test. These coefficients are too low to possess predictive value. Alienation coefficients are above ·90 and suggest that the variables tested in the two sets of scales are relatively independent.

(2) The Serial Sevens Test, accordingly, cannot be used as an abbreviated psychometric examination in the rapid screening of mental defectives. Nor can it be used in the accurate quantification of levels of intelligence. The test does not appear to measure adequately whatever mental functions are tested by the Verbal Battery of the Bellevue-Wechsler Scale.

(3) An average (for 201 white males) success score of 4·0 on the Sevens Test could be earned by any white male aged from 17 to 24 years who has a Bellevue-Wechsler IQ ranging from 55 to 94. For negroes, as tested in this sampling, the IQ range is roughly the same with an average success score of 3·0.

(4) Patterned sequences (see text) are evidenced among the responses of those adjudged to be free from psychiatric disability. No pattern, however, is typical or diagnostic of the ament.

(5) Preliminary study of the optimal ways for the administration of the Sevens Test revealed the need for standardized procedure including especially the use of simple language in setting the task for the examinee.

(6) The present results coupled with those reported by previous investigators indicate that the Serial Sevens Test is restricted in its range of applicability. First, evidence presented by Sherman indicates that error scores do not tend to decrease until an IQ of 90 is reached among the 113 children studied. In the present study only 18 per cent. of those with intelligence quotients between 89 and 94 were able to solve the Sevens problem within a two-minute interval with a maximum of two errors. If the test is to be administered to adults, it would seem advisable only to do so when the intellectual status as quantified by an IQ of 100 or better (Bellevue-Wechsler Scale). Second, the Sevens Test can at best be given only to those of normal intelligence and to those whose educational qualifications (eight grade or better) are such as to insure their knowledge of basic arithmetic processes. If these two restrictions are admitted, then the evidence reported by Bronner *et al.* and Hayman indicate that the Sevens Test is of some value in the detection of psychological deficit.

(7) The wholesale administration of the Sevens Test to consecutive examinees in screening examinations is ill-advised and illustrates one misapplication of the scale. (Author's abstr.)

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The Effect of Anoxia as Measured by the Electroencephalogram and the Interaction Chronogram on Psychoneurotic Patients.

1. Observations on the effect of breathing low oxygen are reported in a series of 67 patients and 42 controls, in whom changes in central nervous system activity were measured by the EEG and changes in behaviour by the interaction chronogram.

2. Most subjects showed a shift in EEG to the slow frequencies during the low oxygen. This was more marked and consistent when the CO_2 was less than ·3 per cent. There was no difference between patients and controls.

3. A decrease in verbal and gestural activity was found in about three-fourths of the subjects. The decrease was greater for the patients than the controls.

4. Subjects with high initial activity while breathing air showed the greatest decrease as a result of low O_2. Subjects with low activity rates in air showed slight decreases and, in many cases, an increase.

5. Subjects with marked changes in EEG tended to show an increase in activity.

6. Four factors are discussed as playing a role in determining the changes in activity due to low O_2.

(*a*) Initial rate of activity.
(*b*) Diagnosis.
(*c*) Electroencephalographic changes.
(*d*) Autonomic activity as measured by heart rate.

(Authors' abstr.)

Electroencephalographic Patterns from the Base of the Brain.

Electroencephalographic recordings from the base of the brain give valuable supplementary information to data obtained from conventional scalp recordings. Various locations of the deep lead are possible—subsphenoid, spheno-ethmoidal or subfrontal.

Several varieties of basal patterns are described and illustrated. The effect of visual stimulation, overbreathing, drugs, spontaneous and induced electrical discharges in epileptics, and of gross intracranial pathology is described.

In general the basal rhythm response to various stimuli is similar to that of the cortical (superficial) rhythm. Visual stimulation flattens the basal rhythm and blocks the alpha activity. Hyperventilation induces a build-up in size of potentials and a slowing of rhythm, which may be greater or less than that of the cortex. Autonomic drugs (epinephrine and mecholyl) appear to affect base more than cortex. Sodium amytal in amounts sufficient to produce intoxication but not sleep, results in high voltage fast waves in base as well as cortex.

Electrical paroxysms typical of epilepsy usually are more pronounced at the cortex than at the base.

The basal lead is a valuable adjunct in localization of gross intracranial pathology. (Authors' abstr.)

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The Therapeutic Use of Prolonged Sodium Amytal Narcosis.

During the past eight years we have used prolonged sodium amytal narcosis in the treatment of border-line neuropsychiatric disorders. The therapeutic technique is usually so planned as to produce a toxic delirium after the cessation of drug administration. This therapeutic delirium is judged to be reliably restorative and reconstructive. Various degrees of narcoanalysis and narcosynthesis are permitted, but most benefit follows delirious abreaction. All patients to whom the treatment was administered were helped, some more than others. Dissolution of the faulty personality behavior and constructive recasting of the psychiatric problem probably occur through improved physiological rest and a remobilization of thought processes during an irresponsible and impersonal state of psychomotor activity which is temporarily out of volitional control, and is thereafter always reintegrated at a more acceptable level. (Author's abstr.)

Convulsive Shock Therapy in Patients Over Seventy Years of Age with Affective Disorders.

Experience with a group of 30 patients all past 70 shows that convulsive shock therapy is well tolerated by the aged.

Convulsive shock therapy in the aged can be made more safe if curare modification of the convulsion is utilized. The organic defects and diseases of old age are not necessarily contraindications for curare electroshock therapy.

Follow-up studies show that half of this group of patients obtained sustained recoveries or sufficient recovery to remain functional in society.

Evaluation and retreatment of relapses suggest that prompt treatment of recurrences will produce an early remission and prevent prolonged hospitalization.

No conclusions can be drawn regarding the death rate in this group. (Authors' abstr.)

Sub-coma Insulin and Pentothal Sodium as Aids to Psychotherapy.

1. The technique of combined sub-coma insulin and pentothal narcosis in the treatment of 60 consecutive cases of prolonged anxiety was explained and the results analyzed.

2. Especially encouraging results have been obtained where the anxiety reaction has been superimposed upon a previously stable personality.

3. Although the superficial anxiety is usually all alleviated, if there have been longstanding emotional conflicts, more prolonged psychotherapy is usually necessary to influence them seriously.

4. Sub-coma insulin and pentothal should be looked upon as primarily supportive measures, but definitely serve to promote relaxation and to make the patient more receptive to psychotherapy.

5. It is felt that this form of treatment is practical in cases of prolonged anxiety reaction in civilian practice and is especially applicable to the treatment of this type of case on the wards of a general hospital. (Authors' abstr.)

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Cerebral Anoxia from High Altitude Asphyxiation: A Clinicopathologic Study of Two Fatal Cases with Unusually Long Survival, and a Clinical Report of a Non-fatal Case.

Three cases of anoxic anoxia occurring in aviators while engaged in combat are presented in detail. In two cases the anoxia proved fatal in forty hours and three weeks, respectively, and in the third instance the patient was observed for a period of three weeks and then was transferred to the United States. The degree and duration of anoxia in each case are not completely known. In the first, the accident occurred at an elevation of " more than 20,000 feet," the patient being found unconscious five minutes after completion of a bomb run, at which time resuscitation was commenced. In the second, the patient was exposed to an atmosphere at 24,000 feet for approximately ten minutes. In the third, it was at 27,000 feet that the oxygen tank of the plane was shot away, necessitating a rapid descent to 7,000 feet, during which time no effort could be made to revive the patient.

In the case of approximately forty hours' duration a conspicuous necrosis of ganglion cells was observed in laminas III to VI of the cerebral cortex, the striatum, the cerebellum, Sommer's sector of the hippocampus and the anterior horns of the spinal cord, mostly focal in character, and degeneration of myelin in the internal capsule. Also observed were early proliferation of the fixed tissue cells of the leptomeninges and vascular adventitia and mild exudation of lymphocytes and neutrophils into the meshes of the arachnoid, the perivascular spaces and, to a limited extent, the parenchyma of the brain. In the case of three weeks' duration the changes were of virtually the same location except that the cerebral white matter, brain stem and spinal cord were relatively spared. The profound damage in these cases of sudden and severe anoxic anoxia is strikingly similar to that observed in some of the other forms of anoxia. (Authors' abstr.)

Incidence of Anisocoria and Difference in Size of Palpebral Fissures in Five Hundred Normal Subjects.

Five hundred neurologically normal persons were studied with reference to the incidence of anisocoria and of differences in the width of the palpebral fissures. Nearly 17 per cent. of the patients showed a slight but perceptible anisocoria. In 4 per cent. the difference in pupillary size was pronounced. Inequality of the

palpebral fissures of a slight degree was noted in nearly 36 per cent. of the patients. Pronounced differences were noted in nearly 6 per cent. When both the pupils and the fissures were unequal the smaller pupil and the narrower fissure were on the same side in 77 per cent. of the patients. However, in nearly one-half the patients with anisocoria the fissures were equal, and inequality of the fissures was accompanied with equality of the pupils in 73 per cent. of the patients revealing unequal fissures. Consequently inequality or imbalance of sympathetic innervation could be held responsible for at least some instances of the observed anisocoria, but in general no gross factor could be identified as responsible for any asymmetry of sympathetic stimulation. In other instances differences in errors of refraction may play a role in causing unequal pupils. The incidence of inequality of the palpebral fissures is relatively high, and mild degrees may be considered without significance. Anisocoria should never be dismissed as an anomaly until a thorough search reveals no etiologic basis for it. (Author's abstr.)

Relation of Mental Imagery to Hallucinations.

The mental imagery of 40 patients with schizophrenia, 10 patients who had recovered from an alcoholic hallucinosis and 114 normal subjects was tested.

Schizophrenic patients with auditory hallucinations were found to have a significantly lower mean percentage of auditory imagery than either normal subjects or schizophrenic patients without auditory hallucinations. The normal subjects and the schizophrenic patients without auditory hallucinations did not differ significantly in this respect.

Patients who had recovered from alcoholic hallucinosis were found to have a significantly lower mean percentage of auditory imagery than normal subjects. The mean percentage of auditory imagery for patients who had recovered from an alcoholic hallucinosis and for schizophrenic patients with auditory hallucinations did not differ significantly.

Not only do these findings disprove the old theory that auditory hallucinations are exaggerations of predominating auditory imagery, but they suggest the new concept that one of the factors responsible for auditory hallucinations is relatively deficient auditory imagery. (Authors' abstr.)

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Relation Between Electroencephalographic and Histologic Changes Following the Application of Graded Force to the Cortex.

A new method for the study of cortical cell change in connection with electroencephalographic deviations is introduced.

Electroencephalographic changes vary with the amount of cortical cell damage within a certain critical range.

Below this critical range cortical cell change occurs without corresponding electroencephalographic deviations.

Within the critical range the amount of electrical and cortical cell change is directly proportional to the amount of force applied to the cortex.

Localized cortical cell damage produces localized electroencephalographic changes.

Histologic changes assume a definite pattern of stratification, according to the amount of force applied to the cortex.

Electroencephalographic changes vary with the amount of force applied to the cortex. Reduction in amplitude is directly proportional to the amount of force delivered. The appearance of slow waves is inversely proportional to the amount of force applied to the cortex.

Unilateral convulsive electrical patterns were produced by the mechanical application of force to the cortex.

An attempt is made to relate the authors experimental results to the clinical findings following trauma to the head. (Authors' abstr.)

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The Hostile Dependent Behavior Factor in Rehabilitation of Veterans with Psychoneuroses, etc. *Solomon, A. P.* 777

Loss of Axis-Cylinders in Sclerotic Plaques and Similar Lesions.

Studies by means of the Bodian silver stain for axis-cylinders, which is uniquely specific and especially adapted to the purpose, showed that some degree of damage or destruction of axons occurred in all the sclerotic plaques investigated.

In all but two of the plaques examined the axis-cylinders were reduced to a small fraction of the normal number.

The pathologic appearance of surviving axis-cylinders was more striking in fresh plaques than in old ones.

Similar changes, of about the same degree of intensity, were seen in some other lesions of vascular origin, not sufficiently intense to cause complete necrosis.

The clinical correlation of these observations, especially with respect to treatment, is discussed. (Authors' abstr.)

Electrocerebral Shock Therapy: A Reconsideration of Former Contra-indications.

In a series of 2,181 intramural and extramural patients receiving electric convulsive treatment many presented conditions hitherto considered contra-indications to convulsive shock therapy, such as cardio-vascular disease with and without hypertension, pulmonary tuberculosis, pulmonary fibrosis, skeletal disorders, cerebral arteriosclerosis, general arteriosclerosis, advanced age and organic disease

of the central nervous system in the form of syphilitic meningoencephalitis. With the exception of one death, that of a patient with known severe cardiac disease occurring four weeks after a course of three treatments, there were no complications of moment, and the results from the psychiatric standpoint were more than gratifying. A second death occurred in a man, aged 44, who offered no contra-indications to treatment. Representative cases are cited in which the aforementioned contra-indications existed and treatment was safely and successfully carried out.

It is felt that the former arbitrary and rigid contra-indications to electric convulsive therapy should be relaxed so that many more persons may derive the benefits to be obtained from such treatment. However, there should be no relaxation in the exercise of proper caution in the selection of patients for treatment, the choice to be determined by the overall physical status of the patient, the severity of the presenting psychosis, the immediacy of the need of treatment and the promise of a favourable result. (Author's abstr.)

Electroencephalographic Study of Electric Shock Therapy: Psychotic Patients Treated in a United States Naval Hospital.

In electroencephalographic studies on a series of 106 psychotic men at a naval hospital given varying courses of convulsive therapy with unidirectional current, the following observations were made:

1. The preshock electroencephalograms showed no more abnormalities than are found in comparable normal control records.

2. With shock treatment almost all the patients manifested disturbances in cerebral physiology easily demonstrable in the electroencephalogram. The degree of change varied roughly with the number and the frequency of treatments, but there were many noteworthy exceptions.

3. In the majority of cases the electroencephalogram showed a considerable or a complete return to normal within two weeks after cessation of treatment. In a few cases the abnormalities were more persistent.

4. A careful comparative analysis of the electroencephalograms of the recovered patients (73 per cent,) failed to reveal any significant difference from the records of the patients who did not recover. It is concluded, therefore, that the electroencephalogram does not offer a prognostic guide in electric shock therapy.

5. Likewise, no significant correlation was found between the disappearance or persistence of individual psychotic symptoms and the electroencephalographic pattern, or between the degree of sensorial disturbance and memory impairment and the degree of abnormality in the brain waves. It is thus concluded that the obvious changes in cerebral physiology registered in the electroencephalogram do not give a direct clue to the mechanism of healing in electric shock therapy.

(Authors' abstr.)

Electroencephalographic Studies Following Electric Shock Therapy: Observations on Fifty-one Patients Treated with Unidirectional Current.

Fifty-one patients admitted to the New Hampshire State Hospital received varying numbers of electric shock treatments administered by a machine delivering unidirectional, fluctuating current. Brain waves were recorded prior to treatment, four days after the last treatment and, again, fourteen days thereafter. An analysis of the records revealed the following facts:

1. The highest percentage of abnormal records was obtained in manic depressive patients, closely followed by that for the schizophrenic group. Patients with involutional psychoses and psychoneuroses demonstrated significantly more normal preshock records.

2. In general, an increase of abnormality in the electroencephalographic record was observed after treatment, characterized by increase in voltage, decrease in frequency and appearance of various other abnormalities.

3. The increase in abnormalities was usually directly proportional to the number of treatments.

4. The electroencephalograms of a large percentage of patients receiving less than ten shock treatments had returned to normal fourteen days after the last treatment. Of the group receiving more than ten treatments, a large proportion retained electroencephalographic abnormalities in this recording.

5. In the group receiving ten treatments or less, the electroencephalographic changes seemed to be less pronounced after shock treatment when unidirectional current was used than when alternating current was used.

6. The age-groups between 15 and 24 years and between 45 and 62 years showed a much higher percentage of grossly pathologic electroencephalograms fourteen days after treatment than did the middle-aged group, between 25 and 44 years.

7. A small percentage of patients showed "improvement" in the electroencephalogram after electric shock treatments as compared with their preshock record, a fact which could not be explained and which was clinically unrelated to improvement.

8. Post-shock electroencephalograms closely resembled the records of epileptic patients. However, the breakdown during hyperventilation so characteristic of the electroencephalograms of epileptic patients was rarely observed in the records of patients receiving shock treatment.

9. The following clinical relation between various changes in the brain waves and the psychiatric picture were found: (*a*) An abnormal preshock electroencephalogram usually indicated that a longer course of treatment was necessary in order to achieve clinical improvement. (*b*) A highly abnormal electroencephalographic record fourteen days after the last treatment was usually found with patients requiring further hospitalization. (*c*) A normal preshock electroencephalogram promised a better clinical result from electric shock treatment than an abnormal preshock record. (Authors' abstr.)

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The Hippocampus and the Sense of Smell.

On the basis of data from the literature, a review is given of the anatomical and physiological aspects of the hippocampus of mammals, particularly as regards its alleged association with the sense of smell.

The olfactory fibres from the olfactory bulb and the anterior olfactory nucleus have not been traced to the hippocampus proper. A few fibres are found to the so-called anterior continuation of the hippocampus, which is rudimentary in mammals. The olfactory fibres appear to end only in the peri-amygdaloid and prepiriform area of the so-called piriform lobe, whereas it is doubtful if any reach

its posterior part, the entorhinal area (which in man occupies most of the gyrus hippocampi). The afferent fibres to the hippocampus arise mainly from the entorhinal area, small additional contributions come from the posterior part of the cingular gyrus and probably from the induseum griseum.

All efferent fibres from the hippocampus leave the latter as the fornix. Some of its fibres end in the hypothalamus, the pre-optic region and the septal areas and the habenula, but most of them go to the medial and part of the lateral mammillary nucleus. From this a massive pathway leads through the anterior thalamic nucleus to the cingular gyrus.

From a structural point of view the hippocampus must be considered a typical effector structure, transmitting but a modest proportion of impulses ultimately olfactory in origin, integrated with others the nature of which is not yet known, to the cingular gyrus and to a lesser extent to the hypothalamic, pre-optic and septal areas and the habenula. All the latter connections are probably concerned in influencing subcortical reflexes, olfactory and others, as well as hypothalamic activity. The projection to the cerebral cortex is not understood from a functional point of view. It may be concerned in cortical control of autonomic functions.

Recent physiological experiments have yielded no support for the conception that the hippocampus has important relations to the sense of smell in mammals, nor does clinical evidence seem to favour this view. (Author's abstr.)

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The Adolescent in the Factory.

1. The majority of the adolescents interviewed had been eager to go to work on leaving school at fourteen, because they regarded working as :

(*a*) A new experience, about which there was lively curiosity, or

(*b*) A symbol of growing up, as conferring the status and privileges of the adult, or

(*c*) An opportunity to earn money, which itself was regarded as conferring the prestige and power of the adult, or

(*d*) An opportunity of a fresh start, after failure to make a satisfactory adjustment at school.

2. Owing to ignorance and economic pressure, together with an almost complete lack of guidance, they had been able to exercise little choice of work, with the result that their first eagerness had often been blunted very soon by frustration or disillusioning experiences in the first job.

3. The most prevalent attitudes to work and the work authority revealed by the adolescents in the two factories investigated were those of dissatisfaction and resentment.

4. Neither youth nor sex was found to be the decisive factor in shaping these attitudes. On the contrary, among both sexes the average number of complaints significantly rose with increasing maturity.

5. The dissatisfaction and resentment arose in the work situation itself, and were due to frustration of the adolescent's desires for satisfactory physical development, for security of social status in the factory, and for the acquisition of satisfactory skills in work.

6. These frustrations were attributed by the adolescent workers to physical conditions at work, to long hours, and to mass-production methods in use in these factories, for all of which they had been unprepared, owing to their ignorance of modern factory conditions. They contrasted all these conditions unfavourably with those at school, where the authorities had obviously been concerned about their physical welfare, where hours had been comparatively short, and where they had been given every opportunity to learn.

7. For all these frustrations at work these adolescents blamed the work authority, because in it they had encountered, for the first time, an organized body of adults who, unlike the school authority, seemed to them to care nothing for their welfare.

8. They did not outgrow these feelings of dissatisfaction and resentment because, for the adolescent as a worker in this type of factory, time brings no such hope of developing individual capacities to maturity as it brings him in the wider field of experience outside. In such a work situation the adolescent, deprived of the opportunity to grow up vocationally, feels a sense of waste and frustration which is cumulative, and may be responsible for the attitude of aggression towards the work authority which is the underlying cause of many modern labour troubles.

(Author's abstr.)

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The Clinical Differentiation of Senile and Arteriosclerotic Psychoses.

Senile psychoses are commoner in women than men. They tend to begin later and to last longer than arteriosclerotic mental disease. The onset is gradual and the course steadily progressive, leading eventually to profound mental deterioration.

Arteriosclerotic psychoses are commoner in men than women. They may begin gradually or abruptly. The acute onset is marked by a confused or delirious state, with or without neurologic accompaniments. If this does not terminate fatally, it tends to subside, leaving as a rule a certain degree of mental deterioration, but occasionally leading to a good remission. When the onset is gradual, the picture is similar in many ways to that of senile dementia, both disorders presenting signs of intellectual failure, frequently with emotional reactions and disturbed behaviour. In arteriosclerotic psychoses, however, attacks of confusion may occur at any point, thereby producing a more stormy course with fluctuations in the severity of the mental disturbances.

The intellectual impairment is usually more pronounced in senile than in arteriosclerotic conditions. An exception to this is provided by the paranoid type of senile psychosis, in which the intellectual faculties may be relatively well preserved. However, outspoken and chronic paranoid syndromes are seldom noted in arteriosclerotic disorders. Severe hypochondriacal-like symptoms are often an early feature of the latter, but are not ordinarily prominent in senile psychoses.

While gross neurologic changes are characteristic of arteriosclerotic psychoses, they often fail to occur in the earlier stages, and they may be completely lacking. Cardiac disturbances are common in arteriosclerotic patients. Other characteristic but less frequent symptoms are headache, dizziness, syncopal attacks, convulsive seizures and explosive laughter or weeping.

Sclerosis of the peripheral arteries occurs with equal frequency in the two psychoses. Hypertension is almost as common in senile as in arteriosclerotic patients, though the latter are more apt to show increased diastolic pressures.

Diagnostic problems involving other mental disorders are discussed. The

commonest sources of error are provided by psychoses associated with a variety of toxic or somatic conditions, some of which may be particularly difficult to separate from arteriosclerotic mental disease. Many mistakes owe their origin largely to an uncritical attitude whereby one tends to forget that mental illnesses which are neither arteriosclerotic nor senile are common in later life. (Author's abstr.)

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Is Religious Behaviour Dependent upon Affect or Frustration. *Welford, A. T.* 310
The Sentence Completion Test as a Projective Technique. *Symonds, P. M.* 320

Differential Test Responses of Normals and Mental Defectives.

The present investigation seeks to repeat and enlarge upon current studies of differential test responses of normal and defective subjects of equal mental age. Responses on the 1937 Stanford-Binet Scale, Form L, obtained from 441 defective subjects, were compared with responses of 1,326 members of the standardization group of the scale. A chi-square method of analysis revealed that thirty items of the scale differentiated reliably between the two groups. On eleven of these items the defectives were superior, and on eighteen of the items they were inferior. On one item the younger defectives were superior while the older defectives were inferior. An analysis of the differentiating items casts considerable doubt upon the common belief that defective subjects are superior in rote memory items. On the contrary, rote memory items were relatively harder for defectives than for normals of equal mental age.

Three hypotheses were advanced to account for the results: (1) That the easy items were dependent upon practical experience and therefore could be expected

to be simpler for the older defectives; (2) that the difficult items involved more freedom from intrapersonal rigidity, as defined by Kounin, and hence might be hard for the older defectives; and (3) that the difficult items were more heavily loaded with the general first factor isolated by McNemar on the Stanford-Binet Scale. Evidence is cited suggesting that the first two hypotheses are not adequately supported by the data in the present investigation. The third hypothesis receives support when mean factor loadings of easy and difficult items are compared. It may be concluded that one explanation of the relative difficulty of certain Stanford-Binet test items for defectives, as compared with normals of equal mental age, is that these items are more heavily saturated with the general first factor which has been statistically isolated. (Authors' abstr.).

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The Test Performance of the Brain Injured.

This paper is a preliminary report of an investigation of the performance of fifty brain injured patients on the Bellevue Intelligence Scale, Form 1. An item analysis is made of the eleven subtests. Pertinent data are presented and discussed. Emphasis is placed on the value of using the information subtest weighted score as a basal point for deviation analysis and patterning.

The findings indicate that the brain injured do poorly on the performance items as compared with the verbal items. Moreover, the full scale score reflects a depressed level of efficiency. The sequelae of brain damage by bullet or shrapnel have both overall effects and specific function impairment. The role of personality disturbance accompanying brain damage is indeterminate but effective.

Information, comprehension, and vocabulary are most resistant to damage. Picture completion and similarities withstand to a lesser extent the onslaught of encephalopathy. Arithmetic and picture arrangement fluctuate too widely for definitive evaluation. Most seriously and consistently affected are digit span, digit symbol, block design and object assembly. The specific functions involved in each are discussed.

The mean information weighted score is significantly higher than eight of the ten mean weighted scores as compared with only four reliable deviations from the mean vocabulary weighted score. The critical ratio values are significant enough to establish information as the most feasible basal point for test profiling of the brain injured.

The results also suggest that time and shift play an especially important part in determining function efficiency. (Author's abstr.)

Psychological Types and Changes with Age.

In a sample of 500 males and 500 females Jung's psychological types were examined for age-changes in successive five-year age groups. The notable inferences are that there is progressive though trivial decrease in the feeling-function, definite decrease in extraversion, and most marked decrease in the intuition-function. Or, conversely, it can be said that, as people grow older, they tend to use their thinking slightly more than in youth, to develop their introverted side more clearly, and to use their sensation-function considerably more than at earlier ages. (Author's abstr.)

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The Use of Certain Psychological Tests in the Evaluation of Brain Injury.

A group of 92 brain injured and 108 control patients were given the Hunt-Minnesota Test for Organic Brain Damage. The groups were compared in regard to T scores, visual and auditory raw scores, learning and retention patterns, and interpolated tests. In addition each group was divided into three sub-groups on the basis of the 1937 Stanford-Binet Vocabulary test scores and were again compared in the way mentioned above. No factors were found which are of practical value in differentiating between the groups.

A comparison of the Shipley and Hunt tests was made. The results indicate that little relationship exists between the scores obtained on the two tests.

(Authors' abstr.)

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The Efficacy of Electroshock Therapy in Preventing or Shortening Hospitalization.

This report deals with 242 patients treated with electroshock therapy in the office of the private psychiatrist. Of this number 152, or 63 per cent., were suffering from affective disorders and 77, or 31·5 per cent., from schizophrenia; 127 patients, or 52 per cent., recovered; 191 patients, or 79 per cent., benefited from treatment.

Fifty-one patients, or 21 per cent., of the total were unimproved. Of these 51, 23 patients discontinued treatment prematurely. Fifteen patients, or 6 per cent., required subsequent hospitalization. It is the thesis of this paper that electro-shock therapy, given at the psychiatrist's office, prevents hospitalization in many cases and that such avoidance of commitment is of real benefit to the patient. (Author's abstr.)

AUGUST.

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An Indirect Technique to Induce Hypnosis. *Adler, M. H., and Secunda, L.* 190

Distribution of Carbonic Anhydrase in the Pallium in Nineteen Cases of Paretic Neurosyphilis.

From a study of the distribution pattern of carbonic anhydrase by multiple determinations in the right and left hemispheres in the brains of 19 patients with paretic neurosyphilis, 11 were found to show marked irregularities in the enzyme content ; 8 did not show this tendency.

The 11 brains showing irregularities in distribution were from patients whose spinal fluid findings were still strongly positive, although 5 had received long and intensive treatment.

Of the 8 cases in which irregularities in distribution were not found the spinal fluid findings had either become negative or had shown substantial improvement before death.

Of the 8 cases in which differences in carbonic anhydrase content were not found and in which there was serologic improvement, 5 showed no clinical improvement. The 5 brains from these patients showed low uniform content of carbonic anhydrase, the pattern of which lacked the frontal occipital contour which to date is associated with mortality. (Authors' abstr.).

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*Inhibition of Cholinesterase by Di-isopropyl Fluorphosphate, Physostigmine and Hexaethyl Tetraphosphate in the Roach. *Chadwick, L. E., and Hill, D. L.* 235

Further Localization and Analysis of Adrenergic Synaptic Inhibition.

1. The inhibitory action of adrenaline on sympathetic ganglia is localized to the synapses, and sympathetic fibers are shown to be unaffected.

2. When the synaptic action of adrenaline is followed without interruption (by continuous recording or continuous inspection on a suitable viewing screen)

from injection to the development of full effects, it is evident that the initial action is an inhibition that is not preceded by facilitation.

3. The inhibitory action is interpreted as a primary mechanism reciprocating with the cholinergic excitatory mechanism at sympathetic synapses. A "post-inhibitory" facilitation is described and interpreted as a secondary event comparable to the "rebound" phenomenon, in the production of which the ganglionic ischemia produced by adrenaline may play a role. The interval between administration of adrenaline and the recording of effects will determine whether the primary or secondary effect will make itself apparent as the first recorded action.

4. The synaptic inhibitory action of adrenaline is demonstrated in all types of sympathetic ganglia. The action is, therefore, regarded as a generalized one on adrenergic neuro-neuronal inhibitory junctions. This enhances its importance as a potential physiological mechanism that could participate in synaptic transmission and constitute the basis for a "self-limiting homeostatic mechanism." It does not appear possible that the synaptic action of adrenaline can play any but a protective role in circulatory shock.

5. It is pointed out that it is essential to stimulate sympathetic nerves with fluid, non-polarizable electrodes if quantitative results are to be obtained, unless sufficiently supramaximal shocks are resorted to. Also spontaneous facilitation is apt to occur in sympathetic ganglia unless the stimulus rate is kept low and a good circulation maintained. (Authors' abstr.)

Effect of Parasympathetic Drugs on the Conditioned Response.

The effect of increased intrinsic acetylcholine on the central nervous system has been studied by means of the conditioned response. Eserine, prostigmine, atropine, magnesium sulfate and pilocarpine were used. Only eserine and prostigmine affected the conditioned response; the latter appeared to alter the response by producing discomfort, due to increased intestinal activity. Eserine abolished the conditioned response for as long as two hours, presumably due to the increased acetylcholine in the brain. Magnesium sulfate and atropine each prevent the action of eserine. Pilocarpine exerts a transitory depression and later may facilitate the conditioned response.

Acetylcholine exerts a profound effect on the central nervous system, as indicated by the extinction of the conditioned response—but the mechanism for this action remains obscure. (Authors' abstr.)

Acetylcholine and Neuromuscular Transmission.

When complete block of neuromuscular impulse transmission is produced by soaking the frog's sartorius in 1 : 500,000 acetylcholine in the presence of 1 : 100,000 prostigmine, a nerve impulse still sets up an endplate-potential. With conditions just critical for neuromuscular block, the ACh e.p.p. is slightly larger than the "curare endplate-potential" and has a time course resembling that of the "curare-prostigmine endplate-potential."

The endplate-potential set up by rapid repetitive stimulation exhibits on cessation of stimulation quite discrete fast and slowly decaying components. The slow component is small with the curare e.p.p., and is selectively increased by prostigmine. It is also large with the acetylcholine endplate-potential.

Evidence is presented in support of the hypothesis that prostigmine abolishes the only means for rapid destruction of acetylcholine. The possible mechanism of acetylcholine block is discussed. (Authors' abstr.)

Acetylcholine and Synaptic Transmission in the Spinal Cord.

The hypothesis that acetylcholine (ACh) mediates synaptic transmission has been tested with the frog's spinal cord by investigating the effects produced by investigating the effects produced by abolishing cholinesterase activity by prostigmine (3 or 6 $\times$ 10^{-5} M) and then soaking the cord in strong ACh solutions (up to 6 $\times$ 10^{-3} M or even 1·2 $\times$ 10^{-2} M) in addition.

Prostigmine (like eserine) has no detectable effect on the synaptic potentials set up in the anaesthetized spinal cord by dorsal root volleys even when they are

rapidly repetitive. The strong ACh solutions have about the same depressant action on the synaptic potential as is exerted on the endplate potential by 1/500 times that concentration of ACh.

In the discussion it is argued that, since the cholinesterase will have been virtually inactivated; these observations refute the hypothesis that ACh mediates synaptic transmission in the frog's spinal cord. (Author's abstr.)

Differential Spinal Block. III. The Block of Cutaneous and Stretch Reflexes in the Presence of Unimpaired Position Sense.

1. Position sense and stretch reflex afferents are probably mediated by separate groups of fibers.

2. Under the influence of a differential spinal block, the abdominal, knee-kick and ankle-jerk reflexes are abolished at a time when touch, position sense, vibratory sense and motor power are unimpaired.

3. If the interpretation is correct that the differential blocking effect in the subarachnoid space depends upon the degree of myelination and axon diameter, then it can be concluded that the afferent fibers of the above-mentioned reflexes are subserved by relatively small, unmyelinated fibers.

4. If the interpretation is correct that tendon reflex and position sense afferents are of the same axon diameter and myelinization, then it can be concluded that these latter are not the only factors upon which the differential effect in this type of spinal block depends. (Authors' abstr.)

Viscosity Changes in Axoplasm under Stimulation.

1. Axoplasm flows from all cut squid giant axons not stimulated above threshold after varying periods of elapsed time.

2. Axoplasm does not flow from any cut squid giant axon stimulated above threshold.

3. Failure of axoplasm to flow from cut squid giant axons stimulated above threshold indicates that the stimulating current has induced an increase in the viscosity of the axoplasm within the stimulated axons.

4. The resumption of axoplasm flow from cut squid giant axons within varying periods of elapsed time following cessation of stimulation just above threshold indicates that the process which induced the viscosity increase in the axoplasm is reversible.

5. The reversible changes of viscosity observed in axoplasm under stimulation indicate that the biochemical mechanism involved is probably gelation-solvation. (Author's abstr.)

Electrical Activity in Frog Spinal Cord.

1. In frogs, the isolated second segment of the spinal cord which remains in connection with the forelegs through the second spinal nerves manifests electrical activity. This activity is extremely irregular and differs from that of the intact cord by the predominance of slow waves.

2. A similar electrical activity can be registered from two or more segments of the spinal cord, providing they remain connected with the peripheral organs.

3. When the second spinal nerves, supplying the forelegs, are severed, the electrical activity of the isolated 2nd segment of the spinal cord diminished considerably. There remains the actual spontaneous electrical activity proper to the spinal cord, which activity, however, is a much weaker one. The same was observed after severing the nerve roots of the whole (or parts) of the spinal cord.

4. There exists a continuous interaction between the medulla spinalis and the peripheral organs, and also when the latter are in a state of complete rest.

5. The brain distinctly influences the electrical activity of the spinal cord; when the brain is eliminated electrical activity of the completely isolated spinal cord is reduced. (Authors' abstr.)

Inhibition of Cholinesterase by Di-isopropyl Fluorophosphate, Physostigmine and Hexaethyl Tetraphosphate in the Roach.

1. By means of a manometric technique it has been determined that di-isopropyl fluorophosphate (DFP), physostigmine salicylate, and hexaethyl tetraphosphate (HTP), in the concentrations which are toxic to the roach, *Periplaneta*

americana L., inhibit the cholinesterase activity of roach nerve cord *in vitro* and *in vivo*.

2. The approximate range of concentrations over which these effects were observed were: for DFP, 1×10^{-6} to $1 \times {}^{-4}$ M; for physostigmine, 1×10^{-9} to 1×10^{-4} M; for HTP, 1×10^{-7} to 1×10^{-6} M.

3. With DFP it was found that the percentage of mortality after injection was paralleled closely by the degree of enzyme inhibition which resulted from the same dosage. The comparisons with physostigmine and HTP were less satisfactory.

4. The following LD50s were determined for the compounds by the injection in aqueous solution: DFP, 5·2 mgm. per kgm.; physostigmine salicylate, 15·6 mgm. per kgm.; HTP, 6·75 mgm. per kgm.

5. Although the possibility of other toxic mechanisms for these agents is not excluded, it is concluded that their toxicity is largely a function of their anti-cholinesterase activity. The significance of the findings for certain theories of nervous transmission is discussed. (Authors' abstr.)

JULY

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*Single Fibre Analysis of Inhibition and the Polarity of the Retinal Elements. *Gernandt, B., and Granit, R.* 295
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*Respiratory Effects from Stimulation of the Afferent Vagus Nerve of the Monkey. *Wyss, O. A. M.* 315

Electrical Investigation of the Monosynaptic Pathway Through the Spinal Cord.

The electrical events involved in transmission through a monosynaptic pathway of the spinal cord (quadriceps afferent fibres to quadriceps motoneurones) have been directly recorded by means of a fine needle electrode (insulated to the tip and inserted into the quadriceps nucleus) and an indifferent electrode. The focal potentials so obtained have been subjected to experimental analysis and to interpretation in the light of the theory of focal recording. It has thus been possible to identify the three main components of the complex electrical potential wave set up in the quadriceps nucleus of the spinal cord by a volley in the quadriceps afferent fibres: The diphasic spike set up by presynaptic impulses propagating to their terminals; the synaptic potential of the motoneurones; the spike response of the motoneurones when they initiate the discharge of an impulse.

The focal potential is simplified by making the orthodromic volley small and by deep anaesthesia. Both these procedures eliminate not only the spike responses of the motoneurones, but also the action on them of impulses relayed through interneurones. The focal potential then is produced by a virtually synchronous volley of impulses in the presynaptic terminals and the resulting synaptic potential of the motoneurones, and it has a standard time course. The synaptic potential begins 0·3 to 0·45 msec. after the arrival of the presynaptic impulses, and it rises to a rounded summit in about 1 msec., thereafter decaying approximately expotentially with a half-time of about 1·5 msec.

The synaptic potential recorded from the emerging ventral root has an identical synaptic delay, but a much slower course of rise and decay. It is shown that this divergence should occur if both potentials were produced by a soma depolarization having an intermediate time course.

The excitability of the motoneurones before and during the synaptic potential has been tested by direct and by antidromic stimulation. No significant change is detectable during the early part of the synaptic delay, but there is an abrupt rise of excitability slightly preceding the rise of the synaptic potential. This excitability then decays more slowly than the focal synaptic potential, but possibly with much the same time course as the soma depolarization. It is shown that

these excitability changes agree with those disclosed by synaptic excitation (the familiar facilitation curve), and that all three may be attributable to the synaptic potential. Thus even direct recording from the synaptic region reveals no post-synaptic excitatory process other than the synaptic potential and the soma spike potential initiated thereby.

All the observations agree closely with the predictions of the electrical hypothesis of synaptic transmission. (Authors' abstr.)

Cerebral Regulation of Motor Co-ordination in Monkeys Following Multiple Transection of Sensorimotor Cortex.

1. Multiple intersecting knife cuts were made in the cerebral cortex of monkeys throughout the sensorimotor arm field with overlap into neighbouring cortical areas. These incisions extended roughly through the gray mantle in a vertical plane so as to interrupt and distort all patterns of horizontal intracortical transmission either of definitive excitations over neuronal pathways or of mass intercellular electrical currents. At the same time the cuts left intact the interconnections between separated cortical points via fibers through the medulla.

2. When the incisions were confined to the exposed cortex and extended only as deep as the upper third of layer VI without encroaching on the white matter, the effect on motor co-ordination was negligible. Only a slight and transient depression of function resulted when such incisions were extended into the depths of the fissures. Symptoms of functional depression became increasingly apparent as the incisions, especially in the precentral motor area, were made deep enough to invade the medulla. Nevertheless, when cuts extending into the white matter completely through the transition zone in the lower part of layer VI were placed throughout the sensorimotor arm area, including the depths of the fissures and with extensive overlap into bordering cortical fields, no impairment of motor function could any longer be detected as early as three and one-half weeks after operation. With the electrostimulable foci for movement of shoulder, elbow, wrist, and digits as well as the corresponding sensory points permanently separated from each other as described, there was no inco-ordination in arm and hand movements, reflex, or voluntary, nor did brief tests indicate any deficiency in capacity for motor learning. Typical motor reactions were elicited by electrical stimulation of the partitioned motor area following functional recovery, and typical paralysis resulted thereafter upon its mass removal.

3. The functional symptoms which were observed were characteristic entirely of depression and afunction rather than of positive disorganization, and they appeared to be correlated primarily with invasion of the white matter.

4. The results fail to confirm theories of brain function which have assumed that horizontal intracortical transmission either of discrete excitations or of mass field forces plays any major or essential role in cerebral organization.

(Author's abstr.)

Single Fibre Analysis of Inhibition and the Polarity of the Retinal Elements.

Single fibre reponses have been isolated from the nasal region of the cat's retina with the micro-electrode technique and tested by illumination and polarization of the retina between fixed electrodes.

The pure on-elements respond to threshold cathodal polarization with an on-effect. An increase of current strength by some 30 per cent. elicits a threshold anodal off-effect.

The pure off-elements (inhibited by light) have opposite polarity. They respond to cathodal polarization at the threshold with an off-effect, to anodal stimulation of the same strength with an on-effect (not elicitable by light).

The on-off-elements are either " cathodal " or " anodal " depending upon their off/on-ratio determined by illumination at threshold strength. They are held to be combinations of on-paths and off-paths.

The results form the basis of a simple explanation of the nature of inhibition in the retina in terms of the horizonal and amacrine cells. (Authors' abstr.)

Colour Sensitivity, Contrast and Polarity of the Retinal Elements.

The micro-electrode technique and the cat's retina have been used for a first analysis of the spectral sensitivity of well-isolated retinal elements during anodal and cathodal polarization. It was found that, depending upon the polarity, different spectral regions were enhanced or depressed, so that polarization proved a convenient and very direct method of colour analysis.

The on-elements were sensitive to short wave-lengths only, the off-elements to both long and short wave-lengths ; the on-off-elements had humps or depressions in various regions. The regions in which enhancements or depressions chiefly occurred were (in the order enumerated) 0·520, 0·600, 0·470 and 0·570 μ, the humps in 0·600 μ being particularly large.

The on- and off-components of the isolated spike of an on-off-element were often differentially sensitive to " contrasting " regions of the spectrum, suggesting that the two components are running indifferent but adjacent and well-synchronized fibers. (Author's abstr.)

The Projection of the Frontal Lobe on the Hypothalamus.

By the method of physiological neuronography, discrete projections have been demonstrated from area 6a of the cortex to the mammillary nuclei, the lateral hypothalamic area and to the posterior hypothalamic area. Projections have been demonstrated to the supra-optic and paraventricular nuclei from specific areas of the frontal lobe and the orbital surface, the latter also projecting to the posterior hypothalamic area. (Authors' abstr.)

Respiratory Effects from Stimulation of the Afferent Vagus Nerve of the Monkey.

Electrical stimulation of the afferent vagus nerve in the monkey produces at low stimulus frequencies and low intensities a weak inspiratory reaction. By increasing either the intensity or the frequency of the stimuli, the weak inspiratory effect is converted into one of a strong expiratory pattern. The principle of a frequency-conditioned reversal in vagal respiratory reflexes applies for the monkey as well as for cats, dogs and rabbits. A distinction has been made between the specific vagal respiratory effect and a non-specific acceleration of breathing which may be due to simultaneous stimulation of chemoreceptor or pain fibres.

(Author's abstr.)

J. NEUROL. NEUROSURG. PSCYHIAT.

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The Effect of Reinnervation on Collagen Formation in Degenerating Sciatic Nerves of Rabbits. *Abercrombie, M., and Johnson, M. L.* . . . 89

A Mid-Brain Syndrome Following Head Injury.

Nine cases of severe closed head injury with severe signs of mid-brain injury are reported. The dominant clinical signs were cerebellar, and included severe dysarthria and disturbance of balance. The cerebellar signs were usually most pronounced on one side, and the limbs of the side showing the maximum ataxia tended also to have increased tendon reflexes, Parkinsonian-like tremor, and, in one case, sensory loss suggesting injury to the medial fillet. These signs are thought

to indicate injury to the mid-brain above the decussation of the superior cerebellar peduncles. Additional signs of mid-brain damage were oculo-motor and pupillary disturbances. In at least one case there was early rigidity of all four limbs.

In two cases air encephalography disclosed a marked dilatation of the aqueduct of Sylvius. (Authors' abstr.)

An Outbreak of Atropine Poisoning.

Clark (1940) states that atropine paralyses parasympathetic nerve endings by inhibiting acetylcholine, and that it has a variable stimulating action on the sympathetic, largely masked by the dominance of the action on the parasympathetic endings. Moderate doses produce cerebral stimulation, and there is stimulation of the lower motor centres of the brain. The action is known to be prolonged.

The dose of the liquor is 0·5 to 1 minim, that is 1/200 to 1/100 of a grain of atropine sulphate; 0·5 gr. has proved fatal, but, in a most exceptional case, a dose of 15 gr. was survived. Susceptibility varies enormously. No case in this series had as much as 1 gr.

The acute signs and symptoms are dryness of the skin and secretions, dizziness, impaired vision, dilated pupils, and greatly increased pulse rate, with some increase in respiratory rate and a slight rise of temperature. Excitement, garrulity and restlessness follow, and may lead on to delirium with hallucinations and finally coma. Epileptic attacks may occur, with paralysis of medullary centres. Munns (1929), writing of children under a month old, wonders if the heat-regulating centre is affected.

Young children are known to tolerate its action well, and sensitivity increases with age. Metivier (1935) describes an unusual reaction in a woman of seventy-four, who developed excitement and pleasing hallucinations after being given atropine eye drops. Carter (1940) describes the case of an old man of seventy-three who took 1·2 gr. of atropine. Treatment was not started for ten hours, when convulsions commenced. There was coma, dilated and fixed pupils, retention of urine, dry mouth, stertor, a rapid pulse, and spasticity and profuse perspiration. The spasticity is interesting in view of the rigidity in the attacks described above. Carter's patient was persistently trying to get out of bed and was hallucinated, picking at the bed clothes and later complaining of blurred vision. On the second day he was elated, excited, very talkative, and complained of headache. He had recovered by the fourth day. Concerning the variation in pupillary size, it is interesting to recall the findings of Levine and Schilder (1942) in catatonics. After the instillation of atropine they noted in a proportion of these an inconstancy of pupillary reaction to light and before fixation, suggesting an autonomic imbalance with parasympathetic dominance.

In view of the comparative smallness of the dose of atropine in the cases reported here, and the fact that the prescription was spread over a period of up to ten days, the conclusion can hardly be escaped that the narcotic not only masked the action of the atropine effectively, but also in some way reduced its excretion, so that at the end of treatment an effect was rapidly produced as if something like the total atropine given was acting as a single dose. There was no evidence of renal damage, but there may have been selective changes in kidney function. The striking nature of the parasympathetic-sympathetic swings, which gradually grew in intensity following the cessation of treatment, suggest a " blocking " of hypothalamic cells with dial, followed by a sudden invasion of atropine as the dial was excreted.

Mental illnesses indistinguishable from schizophrenia have been produced by the events here described. These cases closely simulated catatonic excitement, and four cases showed the almost pathognomonic " thought reading and influence by external agencies " of schizophrenia. Daube (1942) has described four cases of " pervitin " psychosis with a general picture of paranoid ideas, illusions, hallucinations, restlessness, irritability, and pronounced anxiety. Some patients were euphoric. These symptoms are similar to those described in the present paper, and suggest a non-specificity in the causal agents which, acting on cortex or mid-brain, or both, can produce schizophrenia-like reactions. Ivy and Goetzl (1943) also have described the excitement produced by " pervitin," and benzedrine-like substance. The strong resemblance to schizophrenia produced by mescaline intoxication which was described by Stockings (1940) is closely paralleled by the cases

described in this paper. The cortical effects of atropine must not be forgotten, but it is tempting to postulate that the dial facilitated a preponderating effect on the hypothalamus. The autonomic disturbances, and the unusual resemblance to insulin coma in one case, suggest a hypothalamic intoxication producing an illness indistinguishable from some forms of schizophrenia. Insulin acts primarily on the parasympathetic, presumably causing a pendulum over-action of the sympathetic and waves of adrenaline secretion. Here the parasympathetic may be paralysed, possibly freeing the sympathetic, or the actual hypothalamic cells may be disturbed in their action. (Author's abstr.)

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Mechanism of Cerebral Death with Doses of NaCN from which the Heart Recovers. *Wheatley, M. D.* 295

Lesions of the White Matter of the Central Nervous System.

A detailed histopathologic study was made of cases of encephalopathy following chemotherapy, brain injury, cerebral fat embolism, inflammatory disease of the nervous system and carbon monoxide exposure where the brunt of the disease fell on the white matter. A characteristic vascular alteration, described under the heading of *vasoparalysis*, was demonstrated in many of these cases. *Vasoparalysis* was confined chiefly to the veins and capillaries of the white matter.

The retarded circulation interfered with an adequate supply of nutrition to the vessel wall itself; if the alteration was severe enough and of prolonged duration, there occurred degeneration of the vessel wall which led to increased permeability. This mechanism would account for edema and hemorrhage, which were frequently observed to be confined to the white matter.

Different regions of the central nervous system are characterized by differences in pattern of their blood supply. The view has been expressed that the regional peculiarities of vascularization of the white matter appeared to be responsible for its selective vulnerability. It was demonstrated that the severe form of tissue destruction was seen in areas with the poorest blood supply. The region with the most abundant vascular supply, the central cortex, was relatively spared in these cases. (Author's abstr.)

J. NEUROSURG.

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Modern Considerations of the Man with Brain Injury.

The continued management of the man with brain injury requires healthy optimism and enthusiasm balanced by an acute sensitivity to each man's distress and deficits and what these mean to him. Each patient must be surveyed biologically and understood as a complex, individual, peculiarly integrated organism, incomprehensible if we restrict ourselves to only a few methods of examining him.

In rehabilitation great possibilities and resources lie within the host himself, for it is his biological make-up and resiliency that remain as potent factors with which to work.

Without therapeutic push under supervision we shall never fully appreciate what assets each patient can muster. With good rapport, knowledge of the patient and his tolerances, and the control of extraneous or experiential factors that hinder these tolerances, each patient will continue to improve for a long time.

The constant presence, inseparability and interaction of organic and functional aspects must be appreciated and worked with. Time is ill-spent in impossible attempts to label each patient as functional or organic. The neurophysiological integration of each individual differs and resounds to the intracranial alterations in its own peculiar manner. Only when the individual who has the brain injury is known can the problems of distress, deficit and disability be comprehended.

It is dangerous to oversimplify these problems merely because organic findings are present. A ventricular dilatation or abnormality in the EEG tracing do not account for every symptom. The future of these men will be tragic if management is oriented only to the cerebral scar, the EEG tracing, the aphasia or the hemiplegia.

The physician himself may present experiences to the patient which have long disabling repercussions. Vacillation, overcaution, slips of the tongue, pessimism, failure in formulations to the patient or relatives, reference to the EEG tracings and X-rays and the constant encouragement of invalidism are avoidable. Emphasis is put on the cheerful spirit of rehabilitation and indicating to each patient his own responsibilities and resources in convalescence.

Headaches, dizziness, paralysis, sensory losses, convulsions, intellectual deficits, emotional instability and psychotic reactions may continue in the traumatized organism. Regardless of what physiological functions are fundamentally disturbed, these have already been peculiarly altered by the life-long and concurrent accumulation of experiences, associations and conditionings contained in the individual organism.

Physician and patient alike must recognize that the brain, like other vital systems, provides a margin of safety whereby alteration of some portions may effect little functioning deficiency. It is unwarranted to assume that brain damage must equal disability, gram for gram, or per cent. for per cent.

(Author's abstr.)

Cerebral Swelling. Histopathology, Classification and Clinical Significance of Brain Edema.

The gross and histopathologic findings of cerebral swelling in 125 cases have been studied.

Regardless of the primary cause of the cerebral swelling (brain tumor, cerebral abscess, massive hemorrhage or cerebral infarction), the findings in all cases were identical.

Attention is called to the incompleteness of understanding of cerebral swelling on the part of both clinicians and pathologists, and to the prevalence of contradictory concepts relative to the condition.

" Cerebral swelling " is the term proposed to denote the gross appearance of a brain characterized by a local or diffuse increase in bulk of one or both hemispheres.

The condition referred to grossly as " cerebral swelling " is represented microscopically by three types of histopathologic change, described as tumefaction, edema and liquefaction. The characteristic histological criteria for recognition of and differentiation among the three types of lesions are given in detail.

Despite discrepancies in their histopathologic features, it is assumed that fundamentally the three conditions represent different stages of the same biologic process; occasionally they may merge insensibly one with another. Attention is

drawn to the significance of unilateral cerebral swelling in the production of transtentorial brain stem herniation.

The role of cerebral swelling in the production of midbrain hemorrhages is emphasized. These are believed to be perivenous in origin, and to be caused by an extreme degree of venous congestion resulting from compression and strangulation of the veins of the herniated midbrain.

In view of the gravity of the clinical symptoms resulting from transtentorial herniation of the brain stem, an attempt to distribute pressure more evenly by means of the establishment of ventricular drainage or by means of section of the free edge of the rigid tentorium may be a life-saving measure, pending final and more radical treatment. (Author's abstr.)

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Central Control of Nervous Functions and the Problem of Sleep.

After a review of the chronaxie theory and the experimental work on identification of the role of the cerebellar Purkinje cells and the red nucleus of the midbrain in effecting the isochronism between peripheral and cortical cells which determines the routing of nerve impulses, the writer goes on to a consideration of the effect of this regulating center upon cortical activity. Suppression of the "subordinating" influence of the center allows the peripheral neurons to return to their "constitutional" chronaxie and results in an increase in cortical chronaxie as well—the inference being that this higher level represents the constitutional chronaxie of the cortical cells. When the level becomes too high the cortex no longer gives evidence of excitation, and simultaneously, the cerebellar regulating center ceases to function. With variations this is the state of affairs in hemiplegia, anesthesia, hypnosis, insulin shock and sleep. The last may be the effect of shutting out afferent impulses to the cortex, which in turn suppresses the cerebellar center, or may be at other times the result of a protective reflex controlled by a center anterior to the red nucleus responding to the toxins of fatigue.

M. R. Sheehan (Psychol. Abstr.).

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Effects of Vitamins A and D in Convulsive States.

No appreciable change either in the frequencies of attacks or in the general physical and mental conditions of the patients were noted after two to three months of vitamin A and D feeding. (Authors' abstr.)

Shock Therapy During Pregnancy.

1. Three cases of pregnant patients who have been treated with various forms of shock therapy are added to those already reported.

2. One manic-depressive went through pregnancy uneventfully while receiving electric convulsive therapy in the sixth and seventh months of gestation.

3. One paranoid schizophrenic miscarried at about four months while receiving her third course of combined electric convulsive therapy and ambulatory insulin.

4. One paranoid schizophrenic went through pregnancy to normal delivery while receiving 90 days of insulin (including eight genuine coma days) and 20 electric convulsive treatments in the fifth, sixth and seventh months of gestation.

5. Pregnancy should not necessarily be considered an indication to deprive a psychotic woman of needed shock therapy. (Author's abstr.)

Clinical Evaluation of a New Sedative-hypnotic (3, 3-*Diethyl*-2, 4-*Dioxotetrahydropyridine*) *in Psychiatric Conditions.*

The study comprised 100 psychiatric patients. NU-903 was used as a somnifacient in 90 cases, who received a total of close to 600 individual doses, usually 0·2–0·4 gm. Results were good to excellent in 61 patients and unsatisfactory in only four. NU-903 was administered for daytime sedation to 43 patients of whom 12 showed poor results and 17 responded with relaxation. The balance of the cases in both groups were classified as fair responses.

The drug proved to have a negligible percentage of after-effects. Six patients whose intake of NU-903 ranged from 17·6 to 33·2 gm., with the medication extending from 31 to 105 days, experienced no ill effects whatever. Moreover, the drug

proved free from habit-forming effects, and its efficacy was not reduced by continued administration.

The effect of prolonged medication on the blood picture was studied in 10 cases. With some deviations these subjects received 0·6 gm. of NU-903 nightly over a period of four weeks. No striking changes in either the red or white blood picture were observed. However, one patient developed a transient, slight leukopenia. Whether the prolonged administration of the drug caused the shift in the white blood count was impossible to ascertain, since repetition of the test had to be interrupted after 19 days. At that time and after a total intake of 11·4 gm. of NU-903 blood findings were normal in this patient.

Results attending the use of NU-903 as a daytime sedative were satisfactory in patients presenting mild tension, anxiety and restlessness. In cases of severe agitation, however, the drug was not sufficiently effective to warrant its recommendation in such a type of psychiatric disturbance.

NU-903 has a distinct value as a quick-acting hypnotic of comparatively short duration in cases of mild and medium insomnia. Except for cases of very severe insomnia in which the preparation was not tried, NU-903 has the advantage over barbiturates of lesser toxicity and therefore better tolerability. Thus, clinical results substantiate the salient pharmacological findings. (Authors' abstr.)

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A Study of First Admissions with General Paresis to Hospitals for Mental Disease in New York State, Year ended March 31, 1945.

1. The rates of first admissions with general paresis have been declining steadily since 1918. The declining trend is more marked among males than females.

2. There has been a declining trend in the percentage of cases in which syphilis was considered a causative factor in mental disease.

3. First admissions with general paresis are younger than all first admissions. Male general paretics are older than female general paretics.

4. The rates of first admissions with general paresis rise to a maximum of 28·2 per 100,000 population among males at the ages of 45 to 49. Among females they rise to a maximum of 7·0 at the ages of 40 to 44.

5. In those age groups with significantly large totals of first admission, the annual rates of first admissions among males exceed those of females in ratios of 3 and 4 to 1.

6. The percentage of first admissions among general paretics with subnormal intelligence is significantly lower than that for first admissions with alcoholic psychoses and for those with dementia praecox, but much higher than that among manic-depressives.

7. First admissions with general paresis include a high percentage with low levels of education, as compared with the general population.

8. General paretics include a higher percentage with normal personality make-up than do all first admissions.

9. Rates of first admissions with general paresis are highest among the divorced and separated. Among males the married have a lower rate than the unmarried. Among females, on the contrary, the unmarried have lower rates than the married.

10. Rates of first admissions with general paresis are higher among urban than rural populations. The farm population has a lower rate than the non-farm population in rural areas.

11. The rate of intemperance is higher among first admissions with general paresis than among any other groups of first admissions, exclusive of those with alcoholic psychoses. Intemperance is especially high among female paretics.

12. Negroes and other colored races (i.e., Chinese) have higher rates of general paresis than whites.

13. Foreign-born white males have a higher rate of general paresis than native white males. Foreign-born white females have a lower rate than native white females.

14. Those born in Ireland and Russia have low rates of general paresis. Foreign-born groups with high rates include those from Scandinavian countries and the West Indies. (Author's abstr.)

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Psychological and Psychophysiological Significance of the Electroencephalogram.

Failure of electroencephalography to make important and extensive contributions in the field of psychology is inferred to indicate either (1) that we have not understood the psychophysiological implications of the electroencephalogram or (2) that the more prominent features of the EEG do not provide a record of the integrative activity of cortex. That the EEG is not primarily a record of the integrative activities but of facilitative and homeostatic regulatory processes which contribute to but which are not essential to integrative cerebral function is shown from the available evidence. It is shown that the activity recorded by the electroencephalogram is part of a mechanism of regulation which maintains varying degrees of equilibrium among the four variables, alpha rhythm, cortical integrative activity, chemical condition and cerebral circulation, with the autonomic nerves to the brain providing an important contributing influence. It is shown how each of these affects each of the others and how an imbalance in the direction of either under- or over-regulation may give rise to psychopathological effects. Implications regarding possible mechanisms of " tension " anxiety, schizophrenia and emotional " functional decortication " are considered with respect to frequently observed effects on the electroencephalogram. Applications in psychology are considered. (Author's abstr.)

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1. Anatomy, Biochemistry, Physiology, Pathology, etc.

The C.S.F. and the F. W. Lorenz Reaction for Diagnosis of Syphilis. Covarrubias, A. R. [*Arch. farm. y Bioquím., Tucumán.*, **3**, 45 (1946).]

The Lorenz Reaction was found to be rapid, convenient and fully as reliable as the other commonly used reactions. L. E. Gilson (Chem. Abstr.).

Comparison of the Colloidal Benzoin Reaction with the Reaction of Dognon in Pathological Spinal Fluids. Guillain, Georges, Laroche, Guy, and Lereboullet, J. [*Bull. acad. med.*, **130**, 432–4 (1946).]

Dognon's reaction requires less cleanliness of equipment and can be performed with 6 drops of liquid, but is less sensitive than the colloidal benzoin reaction. A. E. Meyer (Chem. Abstr.).

Investigations of the Cerebrospinal Fluid in Cases of Rheumatoid Arthritis. Sundelin, Frederick (Nynas Sanatorium, Nynashamn, Sweden). [*Am. J. Med.*, **2**, 579–87 (1947).]

The spinal fluid was examined in 141 cases of rheumatoid arthritis. Almost half of these patients showed some abnormality of their fluid. An increased average globulin-albumin quotient is due to an increase in globulin and decrease in albumin. Although such abnormalities could not be correlated with neurological changes, these manifestations may be an indication of nervous system involvement in rheumatoid arthritis. Barbara R. Murray (Chem. Abstr.).

Determination of Protein in Serum and Cerebrospinal Fluid by Formation of Unimolecular Films. Bateman, J. B. (Mayo Clinic, Rochester, Minn.). [*J. Cellular Comp. Physiol.*, **29**, 85–9 (1947).]

The protein in a volume of 0·0001 to 0·02 c.c. is caused to spread over the surface of a 3 per cent. NaCl solution. The film is compressed until a spot of " indicator oil " shows first-order blue color. The relation between concentration and area covered by the protein at a given surface pressure is linear for diluted normal and nephrotic serum, serum albumin and globulin and cerebrospinal fluid at concentrations below 100 mgm./100 c.c. H. L. Mason (Chem. Abstr.).

Urobilinogen in Cerebrospinal Fluid. Naumann, Hans N. (Taunton State Hosp., Taunton, Mass.). [*Proc. Soc. Exptl. Biol. Med.*, **65**, 72–4 (1947).]

Of 41 post-mortem cerebrospinal fluids examined, 6 contained urobilinogen in amounts from traces up to 9 mgm. per cent. L. E. Gilson (Chem. Abstr.).

Changes in [*Plasma*] *Electrolytes During Post-convulsion Coma. Cicardo, V. H.* [*Rev. Soc. Argentina Biol.*, **22**, 255 (1946).]

In dogs, coma following intense convulsions provoked by electrical stimulation of the brain, or by metrazole is accompanied by a marked increase in plasma K and total acid-soluble P. The plasma K reaches its highest concentration during the coma and decreases during recovery. Total acid-soluble P generally reaches its highest value only after complete recovery of the animal. This suggests that K may be the toxic agent which is responsible for post-convulsion depression. Liberation of K and phosphate is due to tissue anoxia. Much K is liberated by the liver. L. E. Gilson (Chem. Abstr.).

The Influence of Carbon Monoxide on Higher Nervous Activity. Frolov, Yurii P. [*Am. Rev. Soviet Med.*, **4**, 90–1 (1946).]

Various degrees of CO poisoning can be observed by giving subthreshold doses of CO which will accustom an organism to the poison. Severely poisoned newborn white rats and dogs whose brain cortex is not yet fully developed are not sensitive or show little reaction to CO in large concentration (4·1–7·5 mgm./1). Although the absorption of CO by the blood of both adult and young animals was the same and the respiratory functions in both cases were reduced to 70–80 per cent., the absence of a developed brain cortex in the newborn prevented death even with strong concentrations. In experiments on 6 dogs with different forms of higher

nervous activity behaviour, single and repeated CO poisonings showed clear-cut functional changes in the major cortical processes of excitation and inhibition, while the lower parts of the brain and the pons variolii were unaffected. In particular the unconditioned salivary reflexes remained unchanged ; there was a considerable decrease in the conditioned salivary reflexes and a weakening of active internal inhibition. A weakening of the conditioned motor reflexes indicated changes in the motor zone of the cortex. Disturbances of peripheral type were observed, especially eczema. W. R. Henn (Chem. Astr.).

Direct Action of Chemical Substances on Nerve Centers in Physiology and Pathology. Shtern, L. S. (Physiol. Inst. Acad. Sci., Moscow). [*J. Physiol. (U.S.S.R.)*, **32**, 577–88 (1946) (*in Russian*).]

Review of literature with 31 references precedes a *résumé* of more recent and current work of direct application of chemicals to the nerve centers in medicine and biology, which is based on the existence of the hematoencephalic barrier and of an antagonism between the central and the peripheral nervous systems in their reactions to chemical reagents. The method has been used successfully in work with tetanus and encephalitis ; the impermeability of the barrier to the treating agents makes the conventional treatment rather ineffective, whereas the direct administration, such as injection into the spinal fluid, serves to eliminate this difficulty. The differences (antagonism) between the central and peripheral nervous systems to such agents as salts of K, Ca, hormones and hormone-like substances are discussed ; these substances when introduced into cerebral ventricles cause an effect which is opposite to that produced when they directly come in contact with the peripheral elements. Positive results were obtained in traumatic shock when K phosphate was introduced into cerebral ventricles ; similar results were secured in cases of otosclerosis, gastric ulcer, bronchial asthma and other cases of diminished sympathetic or increased parasympathetic tonus. Introduction of tissues, gastric mucosa, pituitary gland, into direct contact with nerve centers, produces an effect which is opposite to that caused by the same metabolites introduced in general circulation. G. M. Kosolapoff (Chem. Abstr.).

Variations in the Angioscotoma in Response to Prolonged Mild Anoxia. Smith, G. M., et al. [*J. Aviat. Med.*, **17**, 590–595 (1946).]

The peripheral blind areas (angioscotomata) of 15 subjects were measured five times during a 7·5 hour exposure to a simulated altitude of 10,000 feet. Control tests were made at a simulated altitude of 1,800 feet with the same subjects. There is a statistically significant increase in the size of the scotoma at altitude. The results also show a progressive and significant increase in the size of the scotoma throughout the test period at altitude. A Chapanis (Psychol. Abstr.).

The Electrical Constants of a Crustacean Nerve Fibre. Hodgin, A. L., and Huxley, A. F. [*Proc. roy. Soc.* B**133**, 444–79 (1946)].

Theoretical equations are derived to describe the characteristics of the local excitatory process when a subthreshold stimulus is suddenly applied. Observations on a nerve taken from the walking legs of lobsters showed that (1) the rise and fall of the extrapolar potential at different distances from the point of stimulation conformed to the theoretically derived curves ; (2) the steady extrapolar potential declined expotentially with distance ; (3) the voltage gradient midway between two distant electrodes was uniform, and (4) the potential recorded was in fact from the membrane. Values (constants) were determined for the electrical resistance of the fluid outside the nerve fiber, the resistance of the axoplasm, the capacity , and the resistance of the surface membrane. The local response was also studied as the strength of the subthreshold stimulus was increased. Matters relating to theories of the nerve impulse are discussed.

A. C. Hoffman (Psychol. Abstr.).

Potassium Leakage from an Active Nerve Fibre. Hodgkin, A. L., and Huxley, A. F. [*Nature, Lond.*, **158**, 376–377 (1946).]

" According to the membrane theory of nervous action, a minute quantity of potassium ions should leak out of a nerve fibre each time that an impulse travels along it." Studies of the membrane conductance of stimulated axons immersed

in oil indicate " that activity is associated with the leakage of a substance the effect of which on the nerve membrane is very like that of potassium . . . during the period of recovery, potassium appeared to be re-absorbed."

A. C. Hoffman (Psychol. Abstr.).

Effect of the Extirpation of the Abdominal Sympathetic Chain and the Removal of the Cerebellum on the Blood Sugar. Yankovskaya, Ts. L. [*J. Physiol.* (*U.S.S.R.*), **32**, 365–76 (1946) (*in Russian*).]

Unilateral removal of the abdominal sympathetic chain causes a drop and in several experiments, also absence of the hyperglycemic reaction due to sugar in a dog. The effects of the extirpation of the cerebellum and of unilateral sympathectomy on the hyperglycemic reaction in dogs after sugar intake are opposite. The sympathetic nervous system is not a conductor of the reaction between the cerebellum and the carbohydrate metabolism. Both systems affect the blood sugar after sugar intake and independently. W. R. Eichler (Chem. Abstr.).

Decrease of Phosphocreatine in Regenerating Neurons. Bodian, David, and Mellors, Robert C. (*Johns Hopkins Univ. Baltimore, Md.*). [*J. Biol. Chem.*, **167**, 655–61 (1947).]

Phosphocreatine determinations were made on normal and regenerating neurons of the ventral gray columns of rhesus monkeys. Regenerating ventral horn cells were produced by sectioning the left brachial plexus and the left lumbosacral roots at their exit from the intervertebral foramina. Regeneration was allowed to continue 6–30 days before analyses were made. The lumbosacral and cervical cords were removed from the living animal under ether anesthesia, then frozen quickly in alcohol dry ice mixture. The frozen segments were split longitudinally, the dorsal quadrants were cut away, then the gray matter of the central horns was isolated by scraping away the white matter. The ventral columns weighed about 80 mgm. each. Chemical determinations were made with a Coleman universal spectrophotometer. Right and left horns of the same section were compared. An average decrease in phosphocreatine of about 40 per cent. was found in regenerating anterior gray, as compared with normal gray columns. Adenosinetriphosphate values were too low for adequate analyses, but its value combined with inorganic phosphate was not significantly different from normal tissue.

Elva G. Shipley (Chem. Abstr.).

Succinic Dehydrogenase in Regenerating Neurons. Howe, Howard A., and Flexner, Josefa B. (*Johns Hopkins Univ., Baltimore, Md.*). [*J. Biol. Chem.*, **167**, 663–71 (1947).]

Comparison in succinic dehydrogenase content was made between normal anterior horns at the limb plexus level and corresponding tissues of animals with extremities completely paralyzed by poliomyelitis. In addition comparisons were made on normal and operated sides of the same animal. Rhesus monkeys were used throughout ; the operations consisted of unilateral sectioning of the nerve roots at levels C4 Th1 and L3–S1. The animals were sacrificed at intervals from 7 to 54 days. Tissues were removed and frozen directly on a block of dry ice, and the white matter dissected away, leaving only the anterior gray cell column. Levels C5–Th1 and L5–S1 were used in the determinations, as these contained all the cells innervating an extremity (a limb segment). Succinic dehydrogenase was determined by the method of Schneider and Potter (*C. A.*, **37**, 5738[9]) or the method of Quastel and Wheatley (*C. A.*, **32**, 7069[2]). The isolated anterior horns of monkeys with limb paralysis following poliomyelitis were found to have approximately 40 per cent. less succinic dehydrogenase than corresponding tissue from normal monkeys. The difference is believed to be due primarily to the absence of anterior-horn cells, and calculations could be made for the activity of single motor neurons from the total normal activity and the number of cells. Maximal reductions of 12 per cent. in succinic dehydrogenase activity were found in anterior horns of animals with unilaterally sectioned nerve roots, as compared with normal sides of the same animal. Nerve section produces retrograde changes only in the motor cells of the anterior horn ; thus the decreased activity was calculated to represent 30 per cent. reduction in enzyme activity in the motor cells.

Elva G. Shipley (Chem. Abstr.).

Resonance of Excitable Tissues. II. Influence of Temperature and Decalcifiers on the Periodic Activity of Nerves. Monnier, A. M. (*Lab. physiol. gen. Sorbonne, Paris*). [*Arch. intern. physiol.*, **54**, 348–71 (1947); *cf. ibid.*, **48**, 129 (1939).]

Nerve preparations exhibit autorhythm in a medium low in Ca or containing Ca-binding ions, such as citrate, oxalate, or phosphate. The effect is greater for non-myelinized nerve preparations, and for specimens obtained from frogs kept at low temperatures. Maximum response of a given experiment is at 25–30°, but this temperature is lowered to 10° by 6–8 cycles of alternatively heating and cooling the nerve. H. L. Williams (Chem. Abstr.).

Inhibition by Sugars of the Stimulation of the Nervous System by Xanthine Bases. Chauchard, P., Mazoue, Henriette, and Lecoq, R. [*Compt. rend. soc. biol.*, **139**, 12–13 (1945); *Chimie and industrie*, **56**, 42 (1946).]

Subcutaneous or intraperitoneal injection of 0·005–0·010 gm. doses of theobromine or caffeine in the albino rat produces in about a week's time a decrease in chronaxia of motor nerves. If 0·5 c.c. of 0·5 per cent. lactose is injected simultaneously, this effect is prevented or cured after two injections. It was observed that this protective action was not specific for lactose but was shared by other ordinary glucides, such as sucrose, galactose, glucose, at the same dose. The same effect is obtained by oral administration.

A. Papineau-Couture (Chem. Abstr.).

Mechanism of Paralysis Resulting from Toxin of Clostridium botulinum. *Action of the Toxin on Acetylcholine Synthesis and on Striated Muscle.* Torda, Clara, and Wolff, Harold G. (*Cornell Univ. Med. Coll., New York, N.Y.*). [*J. Pharmacol.*, **89**, 320–4 (1947).]

The synthesis of acetylcholine by frog brain or mouse brain *in vitro* under either aerobic or anaerobic conditions was markedly diminished by very small amounts of toxins of *Cl. botulinum* types A and B. The responsiveness of frog rectus abdominis muscle to acetylcholine was not modified by low concentrations of the toxins (1–100 mouse LD_{50} per 100 c.c.) and was moderately increased by high concentrations of the toxins (10,000 LD_{50} per 100 c.c.). It appears that decreased acetylcholine synthesis, as far as it is related to myoneural function, is mainly responsible for the "functional paralysis" observed in animals affected by the toxins of *Cl. botulinum*. L. E. Gilson (Chem. Abstr.).

Effect of BAL on Pyruvate Oxidation in Pigeon-brain Dispersions. Whittacker, V. P. (*Dept. Biochem., Oxford*). [*Biochem. J.*, **41**, 52 (1947).]

Low concentrations of BAL (0·5 mm.) cause an increase in the O uptake, in the presence of pyruvate, by pigeon-brain dispersions. This is due to a stimulation of the pyruvate oxidase system. S. Morgulis (Chem. Abstr.).

Effect of Frontal Lobectomy on Blood Sugars of Normal Cats and Monkeys and Adrenal Denervated Cats. Kennard, Margaret A., Hampel, C. W., and Willner, M. Dorrit (*New York Univ. Coll. of Med., New York, N.Y.*). [*Am. J. Physiol.*, **149**, 246–53 (1947).]

In cats in which sham rage is produced by bilateral lobectomy, the blood-sugar level under dial or nembutal anesthesia is increased within half an hour following frontal lobectomy, and may continue raised for at least four to five hours thereafter. No such rise in blood sugar occurs in cats which are anesthetized with barbiturates without frontal lobectomy. Bilateral removal of an amount of occipital lobe approximately equal to that of bilateral frontal lobectomy causes no such rise in blood sugar. There is an accompanying rise of pulse and respiratory rate when blood sugar rises. Previous adrenal denervation causes the blood-sugar rise which appears after frontal lobectomy to fall within three to four hours. No rise in blood pressure occurs after frontal lobectomy, although blood sugar, pulse, and respiration increase. In monkeys, which do not develop sham rage after cortical ablations, there is no change in blood sugar, pulse, respiration or blood pressure after bilateral frontal or occipital lobe ablation.

E. D. Walter (Chem. Abstr.).

The Antagonism of Nicotinamide and Histamine on Isolated Organs with Smooth Muscles. Halpern, B. N., and Dainow, I. [*Z. Vitaminforsch.*, **15**, 260–7 (1944).]

An antagonism between nicotinamide and histamine could be demonstrated on the isolated intestine and the uterus of guinea-pig. The necessary doses of nicotinamide were the same as those of certain amino acids arginine, histidine, cysteine and are much greater than those of antergan. Nicotinamide diminishes the stimulant effect of acetylcholine and of $BaCl_2$ on the isolated intestine, but it seems without effect on the uterine contraction produced by posterior pituitary extract. The specificity and mechanism of the antihistaminic activity are discussed. LEOPOLD SCHEFLAN (Chem. Abstr.).

Experimental Studies of a New Pharmacodynamic Property of Nicotinamide. Antagonistic Action to Certain Effects of Histamine. Halpern, B. N., and Daino, I. [*Z. Vitaminforsch.*, **15**, 250–9 (1944).]

An antagonistic action of nicotinamide against the asthma produced by the inhalation of aerosols of histamine was demonstrated. This action is of specific nature against histamine and cannot be produced against the bronchospasm of acetylcholine. LEOPOLD SCHEFLAN (Chem. Abstr.).

Role of Adrenaline in Recovery of Inhibited Conditioned Reactions. Gellhorn, Ernst (*Univ. of Minnesota, Minneapolis*). [*Proc. Soc. Exptl. Biol. Med.*, **64**, 375–7 (1947); *cf. C. A.*, **39**, 4150⁹.]

Conditioned reactions which have been inhibited by lack of reinforcement in rats can be restored by insulin coma in normal and in adrenodemedullated rats. Apparently a secretion of adrenaline which is observed under conditions of insulin coma and electro-shock does not play a part in the mechanism of restoration of inhibited conditioned reactions. Restoration is not effected in normal rats by injection of insulin. It appears that the restitution of inhibited conditioned reactions is linked up with a hypothalamic-cortical discharge and not due to the liberation of adrenaline which invariably accompanies the excitation of hypothalamic centers under conditions of insulin coma and electroshock.

L. E. GILSON (Chem. Abstr.).

Role of Adrenalin in Recovery of Inhibited Conditioned Reactions. Gellhorn, E. [*Proc. Soc. exp. Biol., N.Y.*, **64**, 375–77 (1947).]

Two series of experiments, using 6 rats as subjects, were performed in order to determine whether increased adrenalin secretion or hypothalamic-cortical effects were responsible for the reappearance of an inhibited conditioned escape response consequent to insulin coma and electrically induced convulsions. Results indicate that (1) restoration of unreinforced conditioned responses after coma or electroshock, occurs in adreno-medullated as well as in normal rats; (2) injections of adrenalin alone fail to restore these responses. The results are discussed theoretically and are related to the problem of efficacy of shock therapy in schizophrenia.

L. A. PENNINGTON (Psychol. Abstr.).

The Influence of Extracortical Factors on the Function of the Central Nervous System. Orbeli, L. [*Amer. Rev. Soviet Med.*, **4**, 206–211 (1947).]

This is a review article presented to the Academy of Sciences, U.S.S.R., 16 May, 1940, which briefly describes the results of experiments performed at the Pavlov Institute. Among the extracortical factors discussed are the effects of castration, removal of the cervical and other sympathetic ganglia, damage to the thyroid, hypophysis, suprarenal and parathyroid glands, and destruction of the hypothalamus and cerebellum. As measured by conditioned reflex techniques these extracortical traumata produce "a weakened function of the cerebral cortex and a disturbance in equilibrium with increase of inhibition. The increased inhibition is relative and follows a weakening of stimulation."

L. C. MEAD (Psychol. Abstr.).

Action of Thiamine Applied Directly to the Cerebral Cortex. *Dias, M. V.* [*Science*, **105**, 211–13 (1947).]

Small filter paper squares, soaked with thiamine hydrochloride in solutions of 1, 2, 5 and 10 per cent., were directly applied to one of the " motor " points in dogs which were craniectomized and a small region of the cortical " motor " area of one side exposed. Rhythmic muscular contractions occurred in the muscle or muscle group corresponding to the cortical " motor " point stimulated. A second application aroused stronger contractions which increased in intensity and frequency. Peripheral stimulation facilitated the response and lead to responses exhibiting the characteristics of localized convulsive reactions. In 34 of the 45 dogs used epileptiform convulsions were obtained with solutions of 2 to 10 per cent. In the remaining 11 dogs only localized muscular clonic reactions were obtained.

F. A. Mote (Psychol. Abstr.).

A Simplified Encephalophone. *Conrad, Matthew, and Pacella, B. L.* [*Science*, **105**, 216 (1947).]

This article gives a wiring diagram and describes the action of a simple adapter which converts the low frequency varying voltages obtained with an electroencephalograph into variations in the pitch of an audible tone.

F. A. Mote (Psychol. Abstr.).

Electroencephalography and Ophthalmology. *Callahan, A., and Redlich, F. C.* [*Amer. J. Ophthal.*, **29**, 1522–33 (1946).]

Recordings of electrical eye potentials following eye movements observed only when the retina is present, are believed to be due to corneo-retinal potential differences. Opening and closing the eyes in the dark and in the light produce similar changes in the occipital rhythm. There was no characteristic finding in amblyopia *ex* anopsia. The effect of opening the eye on the normal occipital rhythm does not differentiate true from malingered or hysterical blindness. Galvanic skin responses recorded on stimulation of a seeing eye can be used to differentiate blind from seeing eyes, thus identifying malingered blindness.

D. J. Shaad (Psychol. Abstr.).

Frequency Analysis of Electroencephalograms. *Gibbs, F. A.* [*Science*, **105**, 132–34 (1947).]

The inadequacies of existing types of electroencephalogram frequency analyzers are pointed out ; for example, frequency analyses are not satisfactory for clinical purposes. Furthermore, the phase component of wave form is not adequately revealed by frequency analysis. The electroencephalogram is a large, detailed, and complicated picture, which fairly easily yields to visual analysis and interpretation ; the task for a machine is almost impossible. Improvements in electroencephalography will come when more attention is given to the selection and training of electroencephalographers and to the taking of easily interpreted, undistorted, and artifact-free records. F. A. Mote (Psychol. Abstr.).

A New Type of Electroencephalographic Electrode Co-ordinator with Semipermanent Electrodes. *Buffington, M. A., and Weil, A. A.* [*Science*, **105**, 185–6 (1947).]

Described is an electrode wire and a unit for holding up to 18 wires in such a position that the greatest part of the weight of the wires is borne by the holding unit, thereby allowing the subject considerable freedom of movement. The region of attachment of electrode and wire is covered by acetone resisting tape. This type apparatus has been found to have long life, to segregate the electrodes, to produce few artifacts, and to give the operator a clear view of the subject's head during the recording. F. A. Mote (Psychol. Abstr.).

A Contribution to the Question of Restriction of the Visual Field Due to the Diencephalon. *Knapp, P., and Schwarzmann, A.* [*Ophthalmologica*, **111**, 270–8 (1946).]

That there exists a direct connection of the optic chiasma with the midbrain has been known for some time. Eugen Frey clearly demonstrated in animals and man that fibers separating themselves from the dorsal part of the chiasm run with

or without crossing to the median section of the tuber cinereum. The physiological significance of a direct connection between chiasm and midbrain was first demonstrated by W. R. Hess, who produced a left-side diathermic coagulation in the midbrain, leaving the optic nerves completely intact, after which there appeared a right-sided hemianopsia. With a diathermic coagulation produced on both sides of the midbrain the animal appeared to be blind, ran into a wall or ran beyond the edge of the table. The present authors cite as further evidence of the connection of the midbrain with restriction of the visual field a case of a woman patient of theirs who began to suffer from concentric narrowing of the visual field, hyperthyroidism, secondary amenorrhea, migraine, collapse, and cyanosis of the extremities. They are convinced that this non-hysterical restriction of the visual field is due to disturbance of the hypophysial-midbrain system which has long been known as seat of hormonal as well as vasomotor functions.

F. C. Sumner (Psychol. Abstr.).

The Fine Structure and Topochemistry of the Nucleus of the Neurones. Sosa, Julio María (Inst. de Investigación de Ciencias Biólogicao, Montevidea, Uruguay). [*Anales facultad med. Montevideo*, **30**, 319–40 (1945).]

With basic aniline, Ag, and Feulgen-Rossenbeck's nuclein staining techniques, determination was made of the organization of and nuclein in the nucleus of the argyrophilic spherules in the nucleolus of the large nerve cells (pyramidal, Purkinje, mitral and anterior horn multipolar) of the central nervous system of chickens, pigeons, cats, rats, guinea-pigs, mice and man, both adult and embryo. The dispersion of the argyrophilic spherules in a reticular network or agglutinated as spheroid masses was a reflection of the metabolic activity of the cells. Failure to demonstrate nuclein in the nucleolus indicated that the spherules could not be elementary chromosomes as proposed by Cajal.

Gegrge K. Davis (Chem. Abstr.).

Phosphorus Metabolism in Active and Inactive Nerves. Bucher, Karl (Univ. California, Berkeley). [*Proc. Soc. Exptl. Biol. Med.*, **65**, 24–6 (1947).]

No difference was found by means of radioactive P^{32} in the P metabolism of stimulated and unstimulated rabbit nerves. L. E. Gilson (Chem. Abstr.).

Effect of Electrically Induced Convulsions on Rate of Alcohol Metabolism in Man. Newman, Henry W., and Yee, James (Stanford Univ. Med. School, San Francisco, Calif.). [*Proc. Soc. Exptl. Biol. Med.*, **65**, 122–3 (1947).]

The convulsions had no influence on the rate of disappearance of EtOH from the circulating blood. L. E. Gilson (Chem. Abstr.).

Analysis of the Effect of Barium upon Nerve with Particular Reference to Rhythmic Activity. Lorente de No, R., and Feng, T. P. (Rockefeller Inst., New York, N.Y.). [*J. Cellular Comp.* [*Physiol.*, **28**, 397–464 (1946).]

Over the range 0·0037–0·043 M Ba ions have a depolarizing effect on frog nerve. The rate of establishment and magnitude of the demarcation potential between the treated segment and untreated nerve increases with increasing Ba ion concentration and reaches a value of 8–10 mv. after 300–400 minutes. In 95 per cent. O_2–5 per cent. CO_2 hyperpolarization often precedes the depolarization that takes place to a smaller extent than in O_2. In N_2 Ba reduces the rate of anoxic depolarization. The reversible stage of conduction block by Ba can be relieved by an applied anodal current and is reinforced by cathodal polarization and rhythmic activity. A concentration of Ba causing severe block in a nerve in O_2 may cause irreversible block in an atmosphere of 95 per cent. O_2–5 per cent CO_2. Myelinated fibers are more susceptible to Ba than unmyelinated fibers. Ba-treated nerve displays spontaneous slow potential oscillations with periods of approximately 1 minute and amplitudes of 0·05–0·1 mv. H. L. Mason (Chem. Abstr.).

Effect of Brain Metabolites on the Secretion of Gastric Glands. Gerchikova, K. A. [*Byull. Eksptl. Biol. Med.*, **21**, *No.* 5, 44–7 (1946).]

The experimental results show the antagonistic action of brain metabolites on the secretion of gastric glands depending on whether they are introduced suboccipitally or in the general circulation. Brain metabolites introduced suboccipitally lower the secretion of gastric glands and introduced in the blood increase this secretion. The mechanism of this antagonistic action is not yet known and is the subject of further study. W. R. Eichler (Chem. Abstr.).

Autonomous Nervous System in the Regulation of Water-mineral Metabolism. Blokhin, N. N., and Pravdina, K. I. [*Byull. Eksptl. Biol. Med.*, **21**, *No.* 5, 26–8 (1946).]

Suboccipital injection of K and Na salts reacts on the autonomous nervous system and increases the tonus of the individual systems. Injection of K phosphates causes retention of H_2O by muscle and brain tissue and greatly decreases recovery of the H_2O. When strong parabiotic agents like K phosphates are injected directly into the ventricle, temporary depression of the parasympathetic centers of parabiotic nature occurs, especially of the sympathetic nervous system. Inhibition of the H_2O metabolism by injection of K phosphate possibly is the result of increased production of pituitrin in the posterior hypophysis, caused by sharp stimulation of the tonus of the sympathetic nervous system.

W. R. Eichler (Chem. Abstr.).

Disturbances of Metabolism Associated with Head Injuries. Pickles, Wilfred (*Rhode Island Hosp., Providence*). [*New Engl. J. Med.*, **236**, 858–62 (1947).]

Seven cases of disturbances in sugar, H_2O or fat metabolism were observed among 2,500 patients with head injuries: 1 had transient glucosuria and subsequent diabetes insipidus, 1 had temporarily resistant diabetes mellitus, 4 had symptoms of diabetes insipidus (in 3 cases responding to pitressin or pituitrin) and 1 had lipemia. Traumatic lesions of the hypothalamic region of the brain are suggested as a possible cause for such disturbances.

Marion Horn Peskin (Chem. Abstr.).

The Protective Action of Sodium Diphenylhydantoinate against Convulsions Induced by Niketamide in White Mice. Granier-Doyeux, Marcel. [*Rev. sanidad y asistencia social* (*Venezuela*), **11**, 377–85 (1946).]

The convulsions induced in white mice by subcutaneous injection of 2 per cent. niketamide [" Coramine " (N,N-diethylnicotinamide)] solution can be prevented by oral administration of 0·2 per cent. solution of Na diphenylhydantoin (Na dilantin) 6 to 12 hours before the injection. This observation could serve as a basis of a biological method for evaluating anticonvulsive drugs.

H. H. Szmant (Chem. Abstr.).

Investigations on the Passage of Tracer Phosphorus into the Nervous System, a Special Use of the Indicator Method. Roeder, F. (*Deut. Forschungsanstalt Psychiatrie, Munich*). [*Naturwissenschaften*, **33**, 111–18 (1946); *Chem. Zentr.*, **1**, 51–2 (1947).]

The central nervous system is composed not only anatomically but also chemically of various kinds of structural units. Within the individual regions there exist in part considerable differences in the Fe and vitamin contents, in the O consumption, etc. The isotope method was used to follow the passage of substances from the blood vessels into the neutral tissue and to study their different behaviour in the individual regions. Phosphates were chosen as the test substance, since they are very closely associated with the various processes of the metabolism of the brain. Radioactive P (P^{32}) was used mixed with inactive P as Mg $(NH_4)PO_4$. This was dissolved in 1N HCl and further diluted with physiological salt solution and then neutralized. The resulting physiologically indifferent solution was similar in composition to Ringer solution. The P was present as the PO_4 ion. Experiments were carried out on 15 dogs, 43 rabbits, and 47 guinea-pigs. The dogs received about 200 microcuries, according to their weight, and the smaller animals received correspondingly smaller amounts. The phosphate solution was injected intra-

muscularly and in no case contained more than 1/30 of the animal's daily phosphate requirement. After a definite interval the animals were killed and the specific activity of individual tissue samples was obtained by determination of the ratio of radioactive P of total P. Total P was determined colorimetrically by the eikonogen method. The frequency with which electrons were emitted from P^{32} was measured by the use of the Geiger-Muller counter. The phosphate was precipitated as molybdophosphoric acid. The specific activity obtained for the central nervous system was very low as compared with that of other organs. The various regions of the brain and the nuclear region behaved very differently. The same values were obtained for identical brain sections taken from the right and left sides of the same animal. Special regions, as the tuber cinereum, showed peculiarities. There was a very pronounced transfer of the tracer phosphate into the peripheral nervous system and into the optic nerves. The influence of the blood content on the specific activation of the brain tissue was studied, as was also the relation between the tracer phosphate and the lipoids of the brain.

M. G. Moore (Chem. Abstr.).

Influence of the Female Sex Hormone (Folliculin) on the Elaboration of Mediators of the Central Nervous System. Kakushkina, E. A., and Tatarko, T. (Timiriazev State Museum). [*Compt. rend. acad. sci. U.R.S.S.*, **55**, 267–9 (1947) (*in French*).]

The content of acetylcholine-like substances of the rat brain is not altered by the injection of folliculin; however, the activity of the esterase is greatly diminished thereby raising the acetylcholine coefficient. R. W. Fleming (Chem. Abstr.).

So-called Popa's Cerebrostimuline. Hamanaka, Shinzo, and Kurome, Kitaro. [*Folia Endocrinol. Japon*, **19**, 381–97 (1943).]

The presence of cerebrostimuline, which accelerates the tissue respiration of the cortex, in mouse cerebrospinal fluid cannot be denied because the R.Q. of the cortex (determined by Warburg's method) tends to be slightly higher in cerebrospinal fluid than in the auto-serum. The cortical R.Q. is not affected by injection of Praehormone (anterior hypophysis preparation), but is markedly inhibited by elimination of KCl from the perfusion fluid, while the R.Q. of liver and kidney is unaffected by lack of KCl. Hence KCl seems to be functionally related to cerebrostimuline, if not its substitute. J. G. Yoshioka (Chem. Abstr.).

Effect of Insulin on the Nervous System. Glazov, V. A., and Petrov, F. P. (Skvortsov-Stepanov Hosp., Leningrad). [*Byull. Eksptl. Biol. Med.* (*U.S.S.R.*), **11**, 291–3 (1941).]

In frog sciatic-gastrocnemius preparations insulin produced a block of the parabiotic nature, removed by a direct current anode, and intensified by the cathode. Insulin applied directly to cut surface of spinal cord increased the latent period of the reflex. Adrenaline, under similar conditions, decreased the latent period and removed the insulin-induced block.

G. M. Kosolapoff (Chem. Abstr.).

Changes in the Activity of Cholinesterase of Nervous Tissue under the Influence of Constant Current. Babsky, E. B., and Minaev, P. F. [*Nature, Lond.*, **158**, 343–4 (1946).]

By means of biological assay of the dorsal muscle of the leech and the m. rectus abdominis of the frog, it was found that "... in 90 per cent. of the experiments the activity of cholinesterase was definitely affected by polarization. ... This influence of polarization upon the activity of cholinesterase was equally manifested in the cerebral cortex and in the nerve fibres. ... The fact that the cathode of constant current lowers the activity of cholinesterase, while the anode produces the opposite effect, that is, increases the activity of this enzyme, may be explained on the basis of the changes that take place in the distribution of ions in the nerve under the influence of polarization."

A. C. Hoffman (Psychol. Abstr.).

The Action of Some Alkaloids of Opium on Cholinesterase. Mihailesco, Vintila V. [*Bull. acad. med. Roumanie*, **18**, *No.* 1/3, 53–5 (1946).]

The rectus abdominis of a frog was suspended in 35 c.c. of oxygenated Ringer solution at room temperature and its contraction measured when 50γ of acetylcholine (I) was added. The smallest amount of serum which would hydrolyze the (I) in 5–10 minutes was determined, and it was shown that morphine sulfate (II), codeine phosphate (III), dionine-HCl (IV) and papaverine-HCl (V) in concentrations of 5 mgm./c.c. did not affect the muscle directly when alone or with serum. In concentrations of over 100γ/c.c., (II) inhibited the serum cholinesterase (VI), whereas (III) and (IV) inhibited it in concentrations of 10, 25, 50, 100 and 250γ/c.c. to an extent proportional to the concentration. In concentrations of 10, 25, 50, 100, 250 and 500γ/c.c., (V) inhibited the (VI). None of these alkaloids changed the pH of the serum. MARSHALL E. DEUTSCH (Chem. Abstr.).

The Role of Cholinesterase in the Action of Estrone on the Vegetative Nervous System. Mihailesco, Vintila V., and Radulesco, Maria. [*Bull. acad. med. Roumanie*, **18**, *No.* 1/3, 56–8 (1946).]

When used by a previously described technique (*cf.* preceding abstr.), estrone (as its benzoate) in concentrations greater than 25 units/c.c. is shown to inhibit cholinesterase. Thus it allows acetylcholine to be stored and improves capillary circulation. MARSHALL E. DEUTSCH (Chem. Abstr.).

Nerve Conduction after Inactivation of Choline Esterase. Boyarsky, L. L. [*Proc. Soc. exp. Biol., N.Y.*, **64**, 106–8 (1947).]

The sciatic nerve of the frog, " exposed to di-isopropyl fluorophosphate (DFP) in a concentration and for a time sufficient fully to inactivate its choline esterase, can still conduct impulses with entirely normal action potentials." It is concluded that choline esterase is not essential to nerve conduction. A brief review of the recent literature is given. L. A. PENNINGTON (Psychol. Abstr.).

Combined Action upon Muscle of Adenosine Triphosphate, Acetylcholine and Potassium, Calcium and Magnesium Ions. Babsky, E. B., and Minaev, P. F. [*Nature, Lond.*, **158**, 238 (1946).]

Work with the dorsal muscle of the leech and the m. rectus abdominis of the frog indicates that adenosine triphosphate, potassium and magnesium, but not calcium, increase the sensitivity of muscle to acetylcholine.

A. C. HOFFMAN (Psychol. Abstr.).

Experimental Antagonistic Action of Anterior Hyophysis Hormones and Acetylcholine on Cerebral Blood Vessels. Relation to Experimental Catalepsy. Baruk, H., David, M., Racine, M. Vallancien, and Borenstein, P. [*Compt. rend. soc. biol.*, **140**, 398–9 (1946).]

In adult male rabbits with the skull trepanned, the intravenous injection of a large dose of anterior hypophysis extract produced a decrease in cerebral vessel diameters, and brain volume, with resulting cataleptic symptoms. Injection of lethal or near lethal doses of acetylcholine caused enlargement of cerebral blood vessels, increase in brain volume and stupor. The two agents given together counteracted each other's effect. L. E. GILSON, (Chem. Abstr.).

Curative Effects of a Complex Choline Compound on the Impaired Metabolism of Choline-deficient Rats. Abdon, N. O., and Borglin, N. E. (*Univ. Lund.*). [*Nature*, **159**, 272–3 (1947).] ; *cf. C. A.*, **41**, 1296i.]

Addition of an acetone-precipitated fraction from extract of splenic tissue (I) (*C. A.*, **39**, 4902[9]) increases the metabolism of muscle tissue of choline-deficient rats to values approaching normal, but does not affect the metabolism of normal muscle tissue. (I) resembles acetylcholine precursor, being soluble in alcohol and H_2O, and insoluble in ether and petroleum ether. (I) is precipitated from aqueous solution by acetone and by Ba salts, but the activity cannot be regenerated from the Ba precipitates. (I) activity is destroyed by boiling in 2N HCl or in 1N NaOH for 15 minutes, but not by boiling at pH 4 for 30 minutes.

CARL C. SMITH (Chem. Abstr.).

Relationships Between Anaphylactic Shock and Acetylcholine Shock. Yañez, Arsacio Peña, and Goñi, Pedro Mariá (*Facultad med. Cádiz*). [*Rev. españ. fisiol.*, **1**, 232–7 (1945).]

Acetylcholine chloride (I) was administered to guinea-pigs in doses of 0·5–2 mgm./100 gm. intracardially. Shock was immediately manifested by convulsions, dyspnea, bradycardia, salivation, lachrimation and frequent defecation and micturition. Recovery took 8–10 minutes for animals not in a state of apnea. Intraperitoneal injection of vitamin B_1 sensitized the animals to (I) and made it possible to produce shock with smaller doses of it. The bradycardia and salivary and lachrimal hypersecretion were not characteristic of anaphylactic shock. Further differences were found in experiments with dogs. Anaphylactic shock was accompanied by an increased coagulation time and a leucopenia. Neither effect was shown by dogs in acetylcholine shock. It is concluded that the two types of shock do not have a common mechanism. MARSHALL E. DEUTSCH (Chem. Abstr.).

Thiamine and the Metabolism of Acetylcholine in the Central Nervous System. Egana, Enrique (*Univ. Chile, Santiago, Chile*). [*Pub. lab. med. exptl. clin. med. Prado-Tagle, Univ. Chile* (1), 127 pp. (1946).]

Acetylcholine was determined in the brain of the rat by using the anterior rectus abdominis muscle of *Caliptocephalus gayi* or of *Bufo chilensis*. Average values for normal and avitaminotic rats are: Whole brain 2·60 and 1·50γ; the cortex contained 2·8 and 1·4γ per gm., respectively; the gray matter 6·8 and 4·2γ per gm. The oxidation of choline by cholineoxidase, prepared preferably according to Mann and Quastel (*C. A.*, **31**, 7908[3]), was studied in the Warburg apparatus. Thiamine has no direct effect on the liver choline-oxidase system of normal and avitaminotic rats. Brain and cortex extracts of normal and avitaminotic animals cannot oxidize choline. Addition of the liver enzyme to cortex extracts increases notably their O consumption. In the absence of substrate, cortex, gray matter, and liver of normal animals form acetoacetate; the amount is less in avitaminotic liver and gray matter, but not in cortex. Presence of acetate decreases acetoacetate in normal gray matter, increases it in cortex, and has no effect in liver. In avitaminotic tissue, addition of B_1 decreases acetoacetate. Citrate decreases acetoacetate in gray matter and liver, possibly by blocking the respiration, while the values in the cortex are increased. B_1 indirectly increases acetoacetate. Pyruvate increases acetoacetate in normal cortex and liver, but decreases it in gray matter. Addition of B_1 causes a marked increase in gray matter and liver. Acetyl phosphate has no influence on acetoacetate formation in normal cortex and liver; addition of B_1 to avitaminotic tissues increases acetoacetate. In gray matter, acetyl phosphate decreases acetoacetate; addition of B_1 causes further decrease. In the brain of avitaminotic rats the activity of cholinesterase is decreased; addition of B_1 or of diphosphothiamine activate it. In the absence of substrate, normal and avitaminotic cortex synthesize acetylcholine to the same amount; avitaminotic gray matter synthesizes it better than normal tissue. Addition of B_1 brings acetylcholine to normal values. Pyruvate increases it, while citrate decreases it slightly. The cholinesterase content of different parts of the rat brain decreases in the following order: pineal gland, gray matter, cortex, cerebellum. In avitaminotic brains all values are slightly higher. *In vitro* B_1 and diphosphothiamine have no influence on cholinesterase; acetylcholine inhibits it in all organs studied. K. SCHOEN (Chem. Abstr.).

Further Proof of the Acetylcholinergic Action of Antigens. Danielopolu, D., and Popesco, Marin (*Acad. Med., Bucharest, Roumania*). [*Compt. rend. soc. biol.*, **140**, *No.* 9–10, 243–5 (1946); *cf. C. A.*, **39**, 2563[2, 6]; **41**, 2155d.]

As previously shown, all antigens (foreign serums, bacterial extracts, tuberculin, etc.), produce inhibition in all organs where the parasympathetic system is inhibitory. The cells in the presence of the antigen liberate acetylcholine (I). The effect is inhibited by atropine, which prevents the parasympathomimetic action of (I) and augmented by eserine and strophanthin, which inactivate cholinesterase (II). With isolated unsensitized rabbit intestine in Tyrode solution at 38 the addition of horse serum provokes contraction due to liberation of (I) from a precursor contained in the tissues. If the bath fluid is now changed and horse

serum again added, no contraction occurs because the (I) precursor is exhausted. If the bath fluid is changed again and (I) is added, contraction occurs for a time and the (I) precursor is reformed in the tissues by hydrolysis of (I) by tissue (II) and conversion to precursor. If the bath fluid is now changed again and horse serum is added, contraction occurs again as in the first part of the experiment. This sequence of effects can be repeated several times with the same segment of intestine.
L. E. Gilson (Chem. Abstr.).

Acetylcholine and Adrenaline Shocks. Danielopolu, D. (Univ. Bucharest.). [*Bull. acad. med. Roumanie*, **13**, *No.* 1/2, 57–67 (1943); *cf. C. A.*, **40**, 6668⁶.]

General acetylcholine shock is caused by production of acetylcholine (I) so rapidly that it passes into the blood directly instead of first being transformed into a complex. A similar mechanism can be used to explain the syndrome due to an excess of adrenaline or sympathin. The hyperproduction of (I) is always associated with or followed by the hyperproduction of adrenaline or sympathin and the inverse is also true. Proposed mechanisms are discussed.
Marshall E. Deutsch (Chem. Abstr.).

Acetylcholine Shock. Danielopolu, D. [*Acta Med. Scand.*, **126**, 595–601 (1947).]

Acetylcholine (ACh) shock is an acute condition characterized by hyperfunction of organs in which parasympathin (P) is the excitor and sympathin (S) the inhibitor, or by hypofunction of organs where P is the inhibitor and S the excitor. The symptoms include bradycardia, A-V block, hypotension, hypothermy, hypermotility of the digestive tract, uterus, or bladder, bronchial constriction, convulsions, leucopenia with mononucleosis and eosinophilia. The shock may be transitory or may end in death. It is associated with an increased production or with a decreased destruction of ACh. This type of shock can be provoked by intravenous injections of ACh. It can be prevented with atropine. In the atropinized animal ACh has a sympathomimetic action, causing hypertension. A similar shock can be provoked by stimulating the peripheral end of the vagus, whereby over-production of ACh is effected. Asthma is due to ACh shock. The disease is associated with a localized parasympathetic preponderance. Similarly, *sea sickness* is a generalized ACh shock caused reflexly through the vestibular organ and can be forestalled with atropine. ACh shock also can be produced by decreased destruction; for instance, by the aid of eserine, but this action is very complicated because of the adrenosecretory action of the eserine. Intoxication by digitalis or strophanthin is also due largely to ACh, since they inactivate cholinesterase. The protective mechanisms which the organism can release against ACh shock are discussed.
S. Morgulis (Chem. Abstr.).

New Proofs of the Acetylcholine Nature of Paraphylactic (Anaphylactic) Shock Studied on Isolated Organs. Danielopolu, D. [*Acta Med. Scand.*, **126**, 589–94 (1947).]

According to D.'s conception, anaphylactic shock is due to the liberation of acetylcholine. The antigen produces two actions: A non-specific effect (paraphylaxis) common to all antigens and associated with liberation in the cells of acetylcholine, and a specific effect due to the particular antigen to which the cell responds with production of antibodies which are formed by a direct union with choline (antibody-choline) which imparts immunity or phylaxis. When a second dose of antigen is introduced, the antigen-antibody-alexin complex is formed and the choline is split off as acetylcholine, which provokes the paraphylactic shock. In experiments on the guinea-pig uterus this latter condition has been shown to occur. It has been further proved that the anti-paraphylactic phenomenon is due not merely to the complete loss of antibodies, but also to the exhaustion of choline in the tissues.
S. Morgulis (Chem. Abstr.).

Effect of Acetylcholine on the Isolated Spinal Cord of the Frog. Kirillova, A. A. [*Bull. biol. med. exptl. U.R.S.S.*, **16**, *No.* 7/8, 53–6 (1943); *Am. Rev. Soviet Med.*, **4**, 269 (1947).]

With the spinal cord kept in Ringer solution containing 1 : 300,000 of eserine, concentrations of 2×10^{-8}–1×10^{-6} acetylcholine were added to the renewed solution after the threshold of reflex irritability was established; 10^{-6} reduced the

irritability markedly, whereas concentrations of 10^{-7} had either a stimulating or an inhibitory effect; lower concentrations increased the irritability. In graphic recording of spinal cord reflexes concentrations of 10^{-6} resulted either in the disappearance of reflex muscle contractions or in their rapid decline, whereas 5×10^{-8} and $3{\cdot}3 \times 10^{-8}$ stimulated the reflexes of the opposite calf muscles. In high concentrations, acetylcholine depressed the isolated spinal cord of the frog, while low concentrations increased reflex reactions. No contraction of muscles connected with nerve centers was observed. This contradicts the role of acetylcholine as an agent transmitting the impulses via the nerve centers; the action of acetylcholine consists in the release or depression of reflex reactions.

W. R. Henn (Chem. Abstr.).

The Acetylcholinergic Action of Antigens and the Acetylcholinic Nature of Paraphylactic (Anaphylactic) Shock. Nicolau, C. T., and Cristesco, N. (First Med. Clinic, Bucharest). [*Bull. acad. med. Roumanie*, **17**, *No.* 4/6, 10–17 (1945).]

Intravenous injection, in human subjects, of horse serum antigonococcus vaccine, and acetylcholine produced leucopenia and increased eosinophiles and monocytes. The effects on pulse rate and blood pressure varied somewhat. The results confirm Danielopolu's conclusions (*C. A.*, **39**, 2563[2]) concerning the acetylcholinergic action of antigens and the acetylcholine nature of paraphylactic shock.

Marshall E. Deutsch (Chem. Abstr.).

Shock and Ovarian Acetylcholinogenesis. The Acetylcholinergic Function of the Follicular Hormone. Crainicianu, Al. [*Bull. acad. med. Roumanie*, **17**, 133–40 (1945) (*in French*).]

A theory of the mechanism of the cardiovascular action of folliculin (I) is presented. Injections of (I) cause the liberation by the ovaries of a considerable quantity of acetylcholine which passes into the blood and causes hypotension and shock. This theory explains the fact that (I) causes hypotension only in the case of the female and then only if the ovaries are not destroyed or removed.

H. H. Szmant (Chem. Abstr.).

Effect of Adenosine Triphosphate on Muscular Sensitivity to Choline and Acetylcholine. Minaev, P. F. [*Byull. Exptl. Biol. Med.*, **21**, *No.* 5, 37–40 (1946).]

Choline acetylase (*C. A.*, **40**, 7258[7]) from nervous tissue was found active in the presence of adenosine triphosphate. The latter sensitized muscle to acetylcholine. Immersion of muscle tissue in adenosine triphosphate alone did not show a marked effect. However, after washing the adenosine triphosphate from the muscle and immersing in choline marked sensitivity was observed which increased on repetition of washing and immersion. Simultaneous action of the two solutions further increased the sensitivity of muscle. It is, therefore, concluded that the action of adenosine triphosphate is caused by formation of acetylcholine in the muscle itself. The effect may be due to inactivation of cholinesterase present in nervous tissue, since it is known that the anticholinesterase agents, eserine and prostigmine, increase the sensitivity of muscle to acetylcholine. Experiments are being continued.

W. R. E. (Chem. Abstr.).

Mechanism of the Strengthening Action of Parasympathomimetic Drugs on the Effect of Acetylcholine. Koiwaya, Osamu. [*Folia Pharm. Japon.*, **39**, 116–33 (1943).]

The dilatation of the auricular vein of a perfused rabbit ear by acetylcholine is strengthened by an addition of rabbit serum or pretreatment with eserine or prostigmine, but not so markedly with pilocarpine. The depression of rabbit blood pressure by acetylcholine is strengthened for a long time when the animal has been pretreated with eserine or prostigmine, but not with pilocarpine. The excitation of rabbit intestine is strengthened by eserine or prostigmine, which itself has no such action. Pilocarpine is synergistic with acetylcholine in its action on the perfused intestines. The contraction of frog dorsal muscle by acetylcholine is markedly strengthened by pretreatment with eserine, prostigmine, or pilocarpine which, however, is not synergistic when acetylcholine is given first. Eserine and pilocarpine are slightly synergistic in this action. The excitation of frog dorsal muscle

by Ba is strengthened by pretreatment with eserine, prostigmine, or pilocarpine. Acetylcholine is synergistic when given simultaneously, but not when given first. The depressing action of acetylcholine on a perfused frog heart is counteracted or weakened by the extract from the rabbit blood or intestines and also from the frog dorsal muscle owing to the presence of cholinesterase in the tissues. Eserine and prostigmine in a small amount inhibit cholinesterase activity, but pilocarpine does not. All three, however, heighten the inhibition of frog heart induced by electric stimulation of the vagus nerve and markedly excite the frog orbicularis oculi and the parasympathetic peripheral nerve endings. The tonic action of acetylcholine on the perfused frog dorsal muscle and rabbit blood vessels and intestines is strengthened by all three, but that on rabbit blood vessels and heart *in situ* is heightened only by eserine and prostigmine. Here the synergistic effect in the former case is due to the inhibition of cholinesterase action and in the latter more likely to excitation of the parasympathetic nerve endings.

J. G. Yoshioka (Chem. Abstr.).

Effect of Direct Current Anode on the Acetylcholine Content of the Brain. *Raspopova, N. A.* (*State Pedagog Inst., Moscow*). [*Byull. Eksptl. Biol. Med.* (*U.S.S.R.*), **11**, 238–40 (1941).]

In cat (or dog) experiments, electrodes were placed on the exposed cortex of the two hemispheres and a third electrode was placed on neck muscle. The " brain " electrodes were run as cathodes for 10 minutes, then one was disconnected and the other two hemispheres in eserinized Ringer solution were tested for acetylcholine. " Anode " application immediately after " cathode " application led to a drop in acetylcholine level ; this is explained either by repression of its formation or by acceleration of its hydrolysis. G. M. Kosolapoff (Chem. Abstr.).

Comparative Study of the Acetylcholine Content of Vertebrate Nerves. *Filippova, A. G., and Korenebskya, O. G.* (*State Pedadog. Inst., Moscow*). [*Byull. Eksptl. Biol. Med.* (*U.S.S.R.*), **11**, 234–7 (1941).]

Dissected nerve tissues of Anodonta and of frogs, cats and dogs, were macerated in eserinized Ringer solution, and the extract tested on leech muscle. Generally the invertebrate's nerve was found to have more acetylcholine than the vertebrate nerve. The average values were : Anodonta 3·3–6·6γ/gm. ; frog 1·3–2·5 ; dog 0·45–0·9. A possibility exists of the presence of an unknown sensitizer in the Anodonta nerve extract. G. M. Kosolapoff (Chem. Abstr.).

Action of Acetylcholine on Chronaxie and Speed of Conduction of Frog Nerves. *Sozer, F., and Winterstein, H.* (*Univ. of Istanbul, Turkey*). [*Arch. intern. pharmacodynamie*, **73**, 159–77 (1946).] *Cf. following abstract.*

Concentrations of 10^{-3} to 10^{-6} acetylcholine have no effect on the rheobase. A concentration of 10^{-3} increases chronaxie, 10^{-4} decreases it, and 10^{-5} increases it again. Thiamine in concentrations of 10^{-4} to 10^{-6} increases chronaxie. The excitability of degenerated nerves is not restored by acetylcholine. The effect of different concentrations of acetylcholine on the speeed of conduction is such that speed is increased when chronaxie is decreased and *vice versa*.

M. L. C. Bernheim (Chem. Abstr.).

Action of Acetylcholine on Reflex Time. *Sozer, F., and Winterstein, H* (*Univ. Istanbul, Turkey*). [*Arch. intern. pharmacodynamie*, **73**, 294–8 (1946).] *Cf. preceding abstract.*

Intraperitoneal injection of 1·0 ml. of 10^{-3} acetylcholine into the frog prolongs the flexor reflex time. M. L. C. Bernheim (Chem. Abstr.).

Analysis of the Functional Role of Acetylcholine in Electrotonus of the Central Nervous System. *Markosyan, A. A., and Rachkovoi, G. I.* (*Lenin Pedagogical Inst., Moscow.*)

Experiments were performed with spinal frogs employing non-polarizable electrodes using the latent period of the flexion reflex of the leg as indicator of change in central excitability. Eserine, prostigmine, and atropine were applied locally to the spinal cord. It was found that an ascending current increased the

latent period while a descending current decreased it. Eserine and prostigmine caused the anelectrotonic prolongation of reflex time to disappear, while further enhancing the catelectrotonic decrease. In several experiments after eserinization a sharp increase in latent period was observed on applying the descending current. Atropine produced a complete disappearance of the changes in latent period produced by anelectrotonus or catalectrotronus. The observations are related to possible changes in acetylcholine concentration under the electrodes.

EUGENE ROBERTS (Chem. Abstr.).

*Effect of Calcium Ions on the Formation of Acetylcholine in the Central Nervous System and the Nerve "Trunks." Pugachev, A. G. (State Pedagog. Inst., Moscow). [Byull. Eksptl. Med. Biol. (U.S.S.R.), **11**, 241–3 (1941).]*

In experiments on dogs and cats, filter papers saturated with 1–2 per cent. $CaCl_2$ solution were applied locally. In the cortex experiments in most cases the acetylcholine level was significantly depressed (smaller number indicated no change or increase). Sciatic nerve experiments gave similar results, but the decrease of acetylcholine was generally less pronounced.

G. M. KOSOLAPOFF (Chem. Abstr.).

2. Pharmacology, Treatment and Psychiatry.

*Experimental Study of Chronic Alcoholism. Mezey, K. [Anales soc. Biol. Bogota, **1**, 18 (1946).]*

In frogs which had been treated with EtOH for 3–5 months the fat content of brain, liver, kidneys and striated muscles was increased by 39–67 per cent., while N content diminished. The liver lost 90 per cent. of its glycogen. Also the total fat in the brain of frogs and rabbits was increased by 24 per cent. Conclusions: Tolerance to alcohol is due to a change in its distribution in the various organs. This probably explains the altered reaction of the alcoholic toward anaesthetics.

F. FROMM (Chem. Abstr.).

*Ocular Psychoneuroses. Davenport, R. C. [Trans. Ophthal. Soc. U.K., **64**, 24 (1944).]*

Eye complaints may be roughly divided into those with an obvious organic state to cover the symptoms, those where there is present an incontrovertible organic lesion upon which is overlaid the element of neurosis, and those with quite inadequate organic grounds. Crucial for the recognition of psychoneurotic overlay as well as the more defined psychoneuroses are: (1) An appreciation of the personality make-up of the individual meeting the stresses of life; (2) absence of organic state to cover the symptoms after careful examination; (3) relief of symptoms with insignificant correction or persistent complaint despite every possible correction of organic difficulty; (4) ascertainment of what the patient has to gain from the eye complaint.

F. C. SUMNER (Psychol. Abstr.).

*Ocular Psychoneuroses. Doggart, J. H. [Trans. Ophthal. Soc. U.K., **64**, 29 (1944).]*

Certain elements in the case history, such as the patient's attitude toward his occupation, emotional tension, fantastic symptoms, or suggestibility can lend support to a diagnosis of ocular psychoneurosis. During the examination the hesitant answering of questions, inconsistent performance on the ocular test, perplexity in the Maddox rod test and in the Bishop Harman diaphragm test, frequent blinking, flinching, squeezing together of eyelids, and absence of any organic handicap are features of the ocular psychoneurotic. Difficulty in a differential diagnosis between malingering and psychoneurotic inhibition is encountered only at the borderline. Mirror cases may be helped by joint discussion between patient and the ophthalmic surgeon or by prescribing glasses of small refraction error and having nothing to do with the so-called eyestrain; serious cases should have psychiatric treatment.

F. C. SUMNER (Psychol. Abstr.).

The Two Phases of the Hypertension Produced by Acetylcholine after Atropine. Danielopolu, D. [*C. R. Soc. Biol.*, **140**, 298 (1946).]

ACh (I) provokes a parasympathomimetic cellular response, causing liberation of sympathin, which produces a sympathomimetic effect. These two phenomena together produce an amphomimetic effect on the terminal organ, atropine has a parasympathetic-inhibiting action and prevents the parasympathomimetic response. After atropine I produces vasoconstriction. This is the first phase of the production of hypertension. The atropine inhibits the action of cholinesterase, and since the I is not immediately destroyed, it stimulates the adrenal medulla to liberate adrenaline, thus producing a further increase in blood pressure. This is the second phase and is abolished by adrenalectomy.

L. E. Gilson (Chem. Abstr.).

Cardiac Action and Psychiatric Uses of Chinese Schisandra. Siversev, I. I. (*Kazakh Med. Inst. V. M. Molotov, Alma-Ata*). [*Farmakol. i Toksikol.*, **9**, *No.* 4, 10–12 (1946).]

Extracts (0·02 and 0·04 per cent.) of Schisandra leaf (I) mildly intensify systole in healthy isolated frog heart in some but not all tests. In the most active cases (I) increases the minimum volume of relaxed, hypodynamic frog heart. Thus, after perfusion with papaverine-HCl solution (1 : 20,000), then for two hours with Ringer solution and finally with 0·04 per cent. extract of (I), minimum volume rose 56 per cent. in a frog heart isolated by the Gramenitskii method. Extracts of (I) also have favourable effects on mental patients in depressive states, as indicated by clinical trials with 37 patients (15 exogenic and 22 endogenic), each receiving one tablespoon of 1 per cent. extract of (I) three or four times daily.

Julian F. Smith (Chem. Abstr.).

The Lack of Cerebral Effects of d-Tubocurarine. Smith, Scott M., Brown, Hugh O., Toman, James E. P., and Goodman, Louis S. (*Univ. of Utah School of Med., Salt Lake City*). [*Anesthesiology*, **8**, 1–14 (1947).]

A dose of d-tubocurarine chloride (I) 2·5 times that necessary for complete respiratory paralysis and adequate for complete skeletal muscular paralysis was given intravenously over a period of 33 minutes to a healthy trained adult observer not undergoing operation. Inasmuch as no changes occurred in the electroencephalogram, consciousness, and sensorium, or in any aspect of higher central nervous system function, it is concluded that (I) has no significant central stimulant, depressant or analgesic action. Attention is called to the importance of this observation for the proper use of curare as an adjuvant in anesthesia.

Ruth Berrgren (Chem. Abstr.).

Cell Pharmacodynamics. I. Mode of Action of Medicinal Substances. Variations in Cell Respiration in Certain Tissues Under the Influence of Some Drugs. Levy, Jeanne (*Univ. Paris*). [*Bull. soc. chim. biol.*, **28**, 328–32 (1946).]

Preliminary Discussion. II. Respiration of Cerebral Cortex Cells Under the Influence of Associated Hypnotic Drugs. Buchel-Olszycka, L. [*Ibid.*, 333–8.]

EtOH and chloral hydrate together exert a greater inhibiting influence on the O consumption of rat cerebral cortex slices than the calculated sum of their individual effects.

III. Respiration of Cerebral Cortex Cells Under the Influence of Caffeine, Eserine, Ephedrine and Benzedrine. Levy, Jeanne. [*Ibid.*, 338–41.]

Caffeine and eserine increase the O consumption of rat-brain slices. Ephedrine and benzedrine in any concentration have an inhibiting action. Na camphosulfonate slightly increases O consumption, although it is not supposed to act on the central nervous system.

L. E. Gilson (Chem. Abstr.).

Curare—Procurement and Pharmacology of the Dimethyl Ether of Methyl Bebeerine. Brazil, Oswaldo V., Seba, Roched A., and Campos, Joao S. (Inst. Vital Brazil Niteroi). [*Bol. Inst. Vital Brazil*, **5**, 79–96 (1945) (*with English summary*).]

Bebeerine dimethyl ether methyl chloride has a physiological action similar to that of curare. It was prepared by the methylation of purified extracts from the root of *Chondrodendron platyphyllum*. Crystal bebeerine (50 gm.) m. 213–14° from the root of *C. platyphyllum* was heated three hours over a water bath with 500 c.c. of CH_3OH, 15 gm. of Na methylate, and 130 gm. of Mel. The material was cooled till the following day, at which time a cream-coloured substance, which was the iodide of the monomethyl and dimethyl ethers of bebeerine precipitated. Pb chloride (30 gm.) was added, and the material was filtered and twice recrystallized from methanol. The iodide crystals of the dimethyl ether of methylbebeerine thus obtained were prismatic m. 257°. The iodide was converted to the chloride by treatment with an excess of AgCl. The chloride crystallized in bundles of fine needles. The authors conclude that the Me derivations of bebeerine and tubocurarine are isomers. The chloride of the methyl ether of methylbebeerine had greater biological activity than the simple chloride of the bebeerine, the fatal dose of the former when injected intravenously being 0·01 mgm. per mouse (*Drymomys musculos* Natt.) weighing 18–20 gm. and the fatal dose of the latter being 2 mgm. The dose of the methyl ether of methylbebeerine necessary to paralyse the forefeet of the mice was 0·0025 mgm., and to paralyze both pairs of feet required 0·005 mgm. The dose of the chloride of bebeerine needed to paralyze the forefeet was 1 mgm. and that necessary to paralyze both pairs of feet was 2 mgm.; this amount was also the fatal dose. Both drugs caused exophthalmos. Death was preceded by paralysis of the diaphragm. Similar results were obtained on rats, rabbits, dogs, pigeons and frogs (*Leptodactylus ocellatus*). Bebeerine derivations given orally were inactive. They were excreted unchanged in the urine when injected. They did not lower blood pressure in dogs and by implication would not in other species. Dogs receiving 2·5 times the fatal dose could be kept alive by artificial respiration. These experiments show that the fatal effects of bebeerine derivations were due to paralysis of the diaphragm. Bebeerine derivations showed antagonism to prostigmine in the pigeon. Tetanus produced from tetanus toxin in rabbits could be removed by bebeerine derivations. Frogs were unusually resistant to bebeerine, but its action can be demonstrated by injection into the ventral lymphatic sac. Sensitivity to bebeerine derivations differed with different species.

NELLIE M. PAYNE (Chem. Abstr.).

Effect of Cyanide on the Concentration of Lactate and Phosphates in Brain. Olsen, Norman S., and Klein, J. Raymond (Univ. of Illinois, Coll. Med. Chicago). [*J. Biol. Chem.*, **167**, 739–46 (1947); *cf. Albaum et al., C. A.*, **40**, 6164².]

The concentration of lactic acid in brain increases after intravenous administration of subconvulsant, convulsant and fatal doses of cyanide. After administration of the two latter doses, the concentration of phosphocreatine decreases. The changes evoked by the convulsant dose and presumably the subconvulsant, are reversible. The changes are attributable to direct action of cyanide upon brain.

LEONARD KRAEL (Chem. Abstr.).

Effect of Insulin Hypoglucemia and Glucose on Various Amino Acids in Blood of Mental Patients. Harris, Meyer M., and Harris, Ruth S. (New York State Psychiatric Inst. and Hosp., New York, N.Y.) [*Proc. Soc. Exptl. Biol. Med.*, **64**, 471–6 (1947); *cf. C. A.*, **37**, 6725⁴.]

The level in the blood of all the amino acids investigated decreased to a variable extent during insulin hypoglucemia and also after glucose administration. Differences in the behaviour of the individual amino acids under such conditions are discussed.

L. E. GILSON (Chem. Abstr.).

Antiacetylcholine and Antihistamine Action of Cocaine, Procaine and Percaine. Studies with Aerosols and with Isolated Guinea-pig Intestine. Frommel, E., Favre, M., and Vallette, F. (Faculty of Med. of Geneva, Switz.). [*Arch. intern. pharmacodynamie*, **73**, 355–66 (1947).]

The local anesthetics protect guinea-pigs exposed to aerosols of histamine or acetylcholine, and *in vitro* inhibit their action on the ileum.

M. L. C. BERNHEIM (Chem. Abstr.).

Pharmacodynamics of Cerebral Vessels. I. Action of Adrenaline. Popesco, Marin (Univ. Bucharest, Roumania). [*Bull. acad. med. Roumanie*, **17**, 10–20 (1945) (*in French*).]

Simultaneous records of systemic and cerebral (central end of internal carotid) pressures (Huerthle's method) in dogs indicated that cerebral vessels are more sensitive than systemic to vasoconstrictor action of adrenaline. Atropine reinforces this action of adrenaline on the cerebral circulation.

II. Action of Acetylcholine. [*Ibid.*, 21–27.]

Acetylcholine dilates the cerebral blood vessels, and its effect is stronger and of greater duration in cerebral vessels than on the rest of the body. This fact presumably explains the occurrence of fatal cerebral hemorrhages in the course of treatments with acetylcholine preparations. H. H. Szmant (Chem. Abstr.).

The "Shock Therapies" at the Ontario Hospital, London. Geoghegan, D. J. [*Canad. med. Ass. J.*, **56**, 15–24 (1947).]

Based on the observation of 469 patients treated by diverse shock therapies at the Ontario Hospital since 1944 the following conclusions are drawn: (1) Shock therapy is an indispensable part of a well-organized psychiatric hospital; (2) the duration of certain illnesses is notably shortened by the shocks; (3) several mental states of long duration are clinically ameliorated by this therapy; (4) the danger of this mode of treatment is minimal and it is possible to apply it to cardiorenal cases if the cases are well chosen; (5) electro-shock is the shock treatment of choice, insulin shock being reserved for patients resistant to electro-shock or for certain psychoses where this therapy is more particularly indicated as, for example, schizophrenia; (6) psychotic reactions due to certain infections or intoxications benefit from shocks; (7) curare should only be utilized in rare cases as an adjuvant of shock therapy; and (8) study should be continued as to the value of shock treatment as a prophylactic for certain mental states.

F. C. Sumner (Psychol. Abstr.).

Effect of Convulsive Activity on the Concentration of Brain Glucose, Glycogen, Lactate and Phosphates. Klein, J. Raymond, and Olsen, Norman S. (Univ. of Illinois Coll. of Med. Chicago). [*J. Biol. Chem.*, **167**, 747–56 (1947); *cf. Stone, et al., C. A.*[3] **39**, 5309[8]; *Albaum et al., C. A.*, **40**, 6164[2]; *Kerr and Antaki, C. A.*, **32**, 996[6].]

Induced convulsive activity is accompanied by decreased concentration of brain glycogen, glucose, phosphocreatine, and adenosinetriphosphate, and increased concentration of lactate, adenosinediphosphate, and inorganic phosphate. The cerebral metabolism of glucose is markedly increased during convulsive activity.

Leonard Karel (Chem. Abstr.).

Effects of Some Old and Proposed Anticonvulsants on the Threshold for Electrical Convulsions. Chu, W. C., and Driver, R. L. [*Proc. Soc. exp. Biol., N.Y.*, **64**, 245–48 (1947).]

The possible therapeutic effectiveness of selected anticonvulsant drugs is tested initially by analysis of the effects of each upon the electrical threshold at which epileptiform convulsions are artificially induced in laboratory rats and rabbits. Four hundred tests were made on 210 animals, and 23 drugs were studied. One of the three hydantoins studied appeared "promising," although no more so than the form currently in use. Four drugs of the curare group and 5 vital dyes, including hematoxylin and vital red, were ineffective.

L. A. Pennington (Psychol. Abstr.).

Isopropyl Alcohol, Other Ketogens, and Miscellaneous Agents on Thresholds for Electrical Convulsions and Diphenylhydantoin. Driver, L. [*Proc. Soc. exp. Biol., N.Y.*, **64**, 248–51 (1947).]

The difficulties inherent in administering ketogenic therapy in epileptic states led to the present testing of the effect of products of fat and carbohydrate metabolism upon thresholds at which electrically induced convulsions in laboratory

animals appear. Results indicate that several chemical compounds exceed the effectiveness of dilantin as an anticonvulsant. The most promising were those chemicals related to acetone, of which group isopropyl alcohol exhibited a "tremendous anticonvulsant effect without ataxia or narcosis." It is hazarded that the effectiveness of the ketogenic diet rests upon the production of acetone in the body. Isopropanol in combination with dilantin raised the electrical threshold far in excess of the latter's anticonvulsant level.

L. A. PENNINGTON (Psychol. Abstr.).

Measurements of the Electrical Activity of Cholinergic, Adrenergic and Anticonvulsant Drugs. Barnes, T. C., and Mauer, I. (Hahnemann Med. Coll., Philadelphia, Pa.). [*Arch. intern. pharmacodynamie*, **73**, 386–91 (1947).]

Prostigmine has a phase-boundary potential greater than any drug thus far studied. Phenobarbital and dilantin generate positive potentials, which counteract the negative acetylcholine potential. Benzedrine gives three times the value of paredrine.

M. L. C. BERNHEIM (Chem. Abstr.).

Effect of Metrazole on the Electrical Excitability of the Respiratory Centre when Depressed by Phenobarbital. Arellano, Maria I. Robert de Ramirez de (Northwestern Univ. Med. School, Chicago). [*J. Pharmacol.*, **90**, 95–103 (1947).]

Intact cats, anesthetized with Na phenobarbital (I), and decerebrate cats, were given large intravenous doses of metrazole after the respiratory activity had been depressed with (I). These cats showed considerable recovery of respiratory activity. Decerebrate cats not given (I) showed no consistent stimulation of respiratory activity by metrazole.

L. E. GILSON (Chem. Abstr.).

Effects of Some Old and Proposed Anticonvulsants on the Threshold for Electrically Induced Convulsions. Chu, Wei-Chang, and Driver, Robert L. (Stanford Univ. Med. School, San Francicso, California). [*Proc. Soc. Exptl. Biol. Med.*, **64**, 245–8 (1947).

Rats were protected more or less against electrically induced convulsions by isonipecaine, propazone (5,5-dipropyl-2,4-oxazolidinedione), diphenylhydantoin, methylhexylhydantoin, methylamylhydantoin, and di-isobutylhydantoin. The following were ineffective: 3-indolylmethylenehydantoin, curare, β-erythroidine, dihydro-β-erythroidine, quinine ethochloride, theophylline-NaOAc, hematoxylin, Congo red, neutral red, phenol red, methyl red, NH_4SCN, $MgSO_4$ and glutamic acid. A decrease of about 30 per cent. in the threshold was obtained by depriving rats of food or water or both for six days.

L. E. GILSON (Chem. Abstr.).

Isopropyl Alcohol, Other Ketogens, and Miscellaneous Agents on Thresholds for Electrical Convulsions and Diphenylhydantoin. Driver, Robert L. (Stanford Univ. Med. School, San Francisco, Calif.). [*Proc. Soc. Exptl. Biol. Med.*, **64**, 248–51 (1947).]

Isopropyl alcohol, 1.25 gm./kgm. by stomach tube, had a marked protective action against electrically induced convulsions in rats, without producing ataxia or narcosis. It also increased the cortical depressant effectiveness of diphenylhydantoin. 4-Hydroxy-4-methylpentan-2-one (diacetone alcohol), 2,4-dihydroxy-4-methylpentane, Et acetoacetate, PrOH, iso-PrBr, and EtOH afforded some protection (all given by stomach tube). Acetophenone was highly protective but quite toxic. The following were ineffective (given gastrically); the common sugars; lactic, pyruvic, acetic, propionic, butyric, palmitic, citric, malic, succinic, malonic and fumaric acids; BuOH, iso-BuOH, iso-AmOH, iso-Pr ether, and EtOAc. Insulin and Na iodoacetate given hypodermically were ineffective.

L. E. GILSON (Chem. Abstr.).

Studies on Sleep. I. Increasing the Action of Barbiturates by Anticholinesterase Medication. Frommel, Ed., Bischler, A., Gold, P., Favre, M., and Vallette, F. (Univ. Geneve). [*Helv. Physiol. Pharmacol. Acta*, **5**, 64–77 (1947) (*in French*).]

During barbital anesthesia in guinea-pigs there is a decrease in serum cholinesterase activity. The hypnotic action of barbiturates in guinea-pigs and rabbits is

augmented by drugs that inhibit the action of cholinesterase, especially prostigmine and the Me_2-NCOOH esters of p-hydroxyphenyldimethylamine-HCl and p-hydroxyphenyltrimethylammonium iodide and methylsulfate.

II. Increasing the Action of Barbiturates by Drugs which Act on the Vagus, and the Action of Morphine and Scopolamine on Barbiturate Narcosis. [*Ibid.*, 78–84.

Acetylcholine salts, carbaminoylcholine pilocarpine-HCl and morphine-HCl sensitized guinea-pigs so that sleep was produced by doses of barbiturates ordinarily insufficient to produce an effect. Scopolamine-HBr had no such sensitizing action. One effect of morphine is to block cholinesterase. Pilocarpine acts as an excitant of the parasympathetic system; hence vagal activity appears to be concerned in sleep production.

III. Sympathomimetic, Sympatholytic and Parasympatholytic Drugs and Barbiturate Narcosis. Frommel, Ed., Favre, M., and Vallette, F. [*Ibid.*, 85–90.]

Ergotamine and the common sympathomimetic and parasympatholytic drugs do not increase the action of barbiturates. L. E. Gilson (Chem. Abstr.).

Barbiturate Poisoning and Treatment with Picrotoxin. Nunez, A. Ortega, and Ventura, A. Estades (Inst. J. C. Mutis, farmacognosia, Madrid). [*Farmacoterap. actual (Madrid)*, **4**, *No.* 31, 38–62 (1947).]

The action of barbiturates and the chemistry and pharmacology of picrotoxin are discussed. Dogs and cats were poisoned with lethal doses of phenobarbital orally or intravenously. Picrotoxin produces a temporary increase in respiration. The action is most rapid by suboccipital application. An intensive increase in depth and rate of respiration is complicated by convulsions. The effect of picrotoxin lasts for one to two hours, that of the barbiturate five to six days. Solutions in oil seem to have a longer action; in one dog, life seemed to be prolonged by picrotoxin in oil. In cases of circulatory failure the additional treatment with circulatory stimulants becomes necessary. A. E. Meyer (Chem. Abstr.).

Comparative Central Depressant Actions of Some 5-phenyl-5-alkylbarbituric Acids. Alles, Gordon A., Ellis, Charles H., Feigen, George A., and Redemann, Mildred A. (Univ. California Med. School, San Francisco). [*J. Pharmacol.*, **89**, 356–67 (1947).]

Additional evidence, from studies of the comparative central actions of dialkyl-, phenylalkyl-, and diphenylbarbituric acids, is presented to show that the mechanism which raises the convulsant threshold is different from the mechanism producing hypnosis as evidenced by ataxia and drowsiness. Anticonvulsant activity is intensified by the presence of one 5-phenyl group, diminished by presence of a second 5-phenyl group, and maximum with the phenylbutyl compound in the series of phenylalkyl (ethyl to hexyl) barbituric acids. Of the 10 compounds studied, 5-phenyl-5-butyl-barbituric acid showed the widest range between anticonvulsant and hypnotic activities. It showed marked anticonvulsant activity at dose levels below the hypnotic dose range. The hypnotic activities of the phenylalkylbarbituric acids are greatest with the compounds containing the smallest 5-alkyl groups, and this type of central depressant activity decreases with increase in the size of the alkyl group. L. E. Gilson (Chem. Abstr.).

Anticonvulsant Activity of Various Nitrogen Heterocycles. I. (Alkylthioether) Barbiturates. II. Phenyl (Alkylthiomethyl) Hydantoins. Cahen, Raymond L. (Maltbie Chem. Co., Newark, N.J.). [*J. Pharmacol.*, **88**, 343–52 (1946).

Most (alkylthioether) barbiturates are effective in the cat only in doses sufficient to produce ataxia. A few compounds of higher molecule weight exhibit the greater anticonvulsant activity independent of any depressant activity; however, the margin between effective dose and ataxic dose remains small. With the exception of the ethyl (tert-butylthioethyl) barbiturate, no compound has as great a duration of action as phenobarbital. Among phenyl (alkylthiomethyl) hydantoins studied in the cat, the Et derivative is the most active; however, it is only 25 per cent. as anticonvulsant as diphenylhydantoin and of shorter duration of action. The margin

between effective and ataxic dose remains about the same for all these derivatives. (Alkylsufonylmethyl) hydantoins are much less active. (Alkylthiomethyl) hydantoins have a slowly developing anticonvulsant activity following oral administration in rat; they prevent metrazole convulsions over a period of 4·5 days repeated administration. C. J. West (Chem. Abstr.).

Experiments in Electrical Anesthesia and Barbiturate Basal Narcosis. Holmes, F. (Univ. Edinburgh). [*Brit. J. Anaesthesia*, **20**, 45–54 (1946).].

A comparative study was made of the effect of some common short-acting barbiturates on the strength of d.c. necessary to anesthetize minnows of varying sizes. Injection of pentothal-Na (Abbott) (I) was followed by an immediate and marked fall in current dose necessary to produce anesthesia; this effect lasted about one hour. Cyclonal-Na (May and Baker) (II) tended distinctly to raise the current-threshold above the pre-injection level, in some cases considerably so, during the period when the effect of the drug was wearing off. The duration of action was shorter and definitely more variable than that of (I). Evipan-Na (Bayer) (III) produced a distinctly irregular action and a sudden falling-off of the current-threshold at varying times after injection. In no case was there a return to the pre-injection level after an hour or more. (II) and (III) have the same chemical formula, yet tend to produce exactly opposite shapes of the curve towards the end of the experiment. No satisfactory explanation can be given at present for this phenomenon. Somnifen (Roche) showed a somewhat irregular action, lasting approximately one hour. Narconumal (Roche) (IV) appeared to have a constant and smooth action which also lasted about one hour. Narconumal in paraldehyde (Roche) caused the fish to become somewhat inco-ordinated some time after the injection and exhibited an action lasting approximately half the time of that produced by (IV). This is contrary to the generally accepted view that if two narcotic drugs are given simultaneously, not only summation but increase of their actions occurs. When used clinically in a few cases, this mixture either failed to produce anesthesia or did so for only a few minutes. Of the drugs tested (I) and (IV) were the most reliable and most constant. A second series of experiments with three fish of different sizes, also indicated that paraldehyde in some way counteracts (IV), shortening its duration of action to approximately half its normal time. Ruth Berggren (Chem. Abstr.).

Action of Curare on Temperature Changes in the Brain in Combination with Pentobarbital Narcosis. Feitelberg, Sergei, and Pick, Ernest P. (Mt. Sinai Hosp., New York, N.Y.). [*Proc. Soc. Exptl. Biol. Med.*, **64**, 345–8 (1947).]

In rabbits under light pentobarbital narcosis the intravenous injection of 2 mgm. of curare increased oxidation processes in the brain, causing a rise of 0·3° in brain temperature. Under deep pentobarbital narcosis it had the opposite effect. L. E. Gilson (Chem. Abstr.).

Effect of Narcosis on the Carbohydrate Metabolism of the Brain as Studied by the Analysis of Afferent Blood. Ivanenko, E. F., and Voĭnar, A. O. [*Byull. Eksptl. Biol. Med.*, **14**, *No.* 10, 25–7 (1942).]

Results from experiments with 35 dogs in which the longitudinal sinus was exposed according to London show that anesthesia decreases the utilization of sugar by the brain, increases the utilization of lactic and pyruvic acids, and increases the output of glycogen. Hexanel or a combination of morphine, ether and chloroform was used for anesthesia. Eugene Roberts (Chem. Abstr.).

Effect of Narcosis on the Glycogen Content of the Brain. Ivanenko, E. F., and Voĭnar, A. O. [*Byull. Eksptl. Biol. Med.*, **14**, *No.* 11/12, 56–7 (1942).]

Experiments with 15 rabbits and 50 albino mice revealed that ether anesthesia significantly increased the glycogen content (I) of the brain. In fed rabbits, the increase was from 130·9 ± 8·2 to 223·6 ± 7·6 mgm. of (I) per 100 gm. of fresh tissue weight. In fasted mice, the (I) increased from 103·4 ± 6·2 to 128·8 ± 4·8 mgm., while in fed mice the increase was from 160·0 ± 5·7 to 201·3 ± 4·1. The anesthetic may act both by decreasing glycolysis and increasing the synthesis of (I) in the brain. Eugene Roberts (Chem. Abstr.).

Action of Narcotics on the Activity of Cholinesterase. III. Concentrations of Substrate and Enzyme in the Manifestations of Inhibitory Action of Narcotics on Enzyme Activity. Mikhel'son, M. Ya. [*J. Physiol.* (*U.S.S.R.*), **32**, 635 (1946).]

The reduction of cholinesterase activity by narcotics was storage at low initial concentrations of acetylcholine and with high values of cholinesterase concentration in the experimental solutions. The study was made in defibrinated dog blood, with EtOH as the narcotic. The above inhibition is strongest when the rate of acetylcholine hydrolysis is highest. G. M. KOSOLAPOFF (Chem. Abstr.).

W. G. MASEFIELD, *C.B.E.*, M.R.C.S., L.R.C.P., D.P.M., *J.P.*

President,
1947—8.